National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
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Scientific and Technical Aerospace Reports

STAR

Volume 41 Issue 13

June 27, 2003

WHAT'S INSIDE

NASA STI Program ... in Profile

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Mathematical and Computer Sciences

Physics

Social and Information Sciences

Space Sciences

General

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for linking to the corresponding document citation from *NASA Thesaurus* terms and personal author names.

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 41, JUNE 27, 2003

01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see *categories 02 through 09*. For information related to space vehicles *see 12 Astronautics*.

20030056593 NASA Glenn Research Center, Cleveland, OH, USA

Integrating Oil Debris and Vibration Measurements for Intelligent Machine Health Monitoring

Dempsey, Paula J.; March 2003; 124 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WU 712-30-13

Report No.(s): NASA/TM-2003-211307; E-13109; NAS 1.15:211307; No Copyright; Avail: CASI; A06, Hardcopy

A diagnostic tool for detecting damage to gears was developed. Two different measurement technologies, oil debris analysis and vibration were integrated into a health monitoring system for detecting surface fatigue pitting damage on gears. This integrated system showed improved detection and decision-making capabilities as compared to using individual measurement technologies. This diagnostic tool was developed and evaluated experimentally by collecting vibration and oil debris data from fatigue tests performed in the NASA Glenn Spur Gear Fatigue Rig. An oil debris sensor and the two vibration algorithms were adapted as the diagnostic tools. An inductance type oil debris sensor was selected for the oil analysis measurement technology. Gear damage data for this type of sensor was limited to data collected in the NASA Glenn test rigs. For this reason, this analysis included development of a parameter for detecting gear pitting damage using this type of sensor. The vibration data was used to calculate two previously available gear vibration diagnostic algorithms. The two vibration algorithms were selected based on their maturity and published success in detecting damage to gears. Oil debris and vibration features were then developed using fuzzy logic analysis techniques, then input into a multi sensor data fusion process. Results show combining the vibration and oil debris measurement technologies improves the detection of pitting damage on spur gears. As a result of this research, this new diagnostic tool has significantly improved detection of gear damage in the NASA Glenn Spur Gear Fatigue Rigs. This research also resulted in several other findings that will improve the development of future health monitoring systems. Oil debris analysis was found to be more reliable than vibration analysis for detecting pitting fatigue failure of gears and is capable of indicating damage progression. Also, some vibration algorithms are as sensitive to operational effects as they are to damage. Another finding was that clear threshold limits must be established for diagnostic tools. Based on additional experimental data obtained from the NASA Glenn Spiral Bevel Gear Fatigue Rig, the methodology developed in this study can be successfully implemented on other geared systems.

Author

Gear Teeth; Systems Health Monitoring; Spiral Bevel Gears; Systems Integration; Vibration Measurement; Oils; Damage; Algorithms

20030056611 Nebraska Univ., Omaha, NE, USA

The Family Science Starter Kit: A Manual to Assist You in the Development of a Family Aeronautical Science Program

Lehrer, Henry R.; November 2002; 29 pp.; In English; Original contains black and white illustrations

Report No.(s): UNOAI-02-6; Copyright; Avail: Other Sources

A Family Aeronautical Science demonstration project was launched during the 2000-2001 school year at the Santee Community Schools in Niobrara, Nebraska. The initial target group for the project was upper elementary children approximately 11 - 12 years of age in the school or those found in grades 4 to 6. The demonstration involved the parents and extended families of those children; faculty and staff of the school and the Nebraska Indian Community College; and faculty researchers of the NASA Nebraska Space Grant Consortium (NSGC) and the University of Nebraska at Omaha (UNO). The demonstration project consisted of three distinct parts, the in-school study of aeronautics during select science classes, the

extensive, after-school use of the school s computer laboratory, and evening Family Aeronautical Science Nights. Key parts of the in-class work were the study of basic aerodynamics, flight control systems, wing design, and basic flight maneuvers. The educational paradigm was that students and teachers would cover several appropriate parts of the study unit at school, the students would continue study after school hours with the family members in the computer lab using an aeronautics CD, and there would be bi-monthly Family Aeronautical Science Nights at the school.
Derived from text
Students; Education; Rocket Launching; Aerodynamics; Schools

20030057163 Swedish Defence Research Establishment, Stockholm, Sweden
Position of a Small Fin on a Missile Body for Maximum Directional Stability
Wackers, J.; 2002; In English
Report No.(s): PB2003-103211; FOI-R-0367-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Windtunnel measurements and CFD calculations were performed to determine the position of a small fin on a missile body that gives the highest directional stability. The model used is the configuration KROPP of the Tvarteknikprojekt, a concept for a future heavy cruise missile.
NTIS
Fins; Directional Stability; Missile Bodies; Computational Fluid Dynamics

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety* and *85 Technology Utilization and Surface Transportation*.

20030056667 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Natural Sunlight and Its Association to Aviation Accidents: Frequency and Prevention
Nakagawara, Van B.; Wood, Kathryn J.; Montgomery, Ron W.; May 2003; 8 pp.; In English
Report No.(s): DOT/FAA/AM-03/6; No Copyright; Avail: CASI; A02, Hardcopy

Glare is a temporary visual sensation produced by luminance (brightness) within the visual field that is significantly greater than that to which the eyes are adapted. Aviators may be subjected to intense glare from natural and artificial light sources that can result in temporary visual impairment, greatly increasing the risk of accidents. The purpose of this study was to investigate the relationship between visual impairment from natural sunlight and aviation accidents. The National Transportation Safety Board Aviation Accident/Incident Database was queried for the period 1/1/1988 to 12/31/1998 for terms related to glare including sun, glare, vision, blinded, and reflections. All reports annotated with one or more of these terms were reviewed to determine whether glare from natural sunlight was considered a direct or contributing factor in the aviation accident. Accidents that did not involve the pilot-in-command of an air transport or general aviation aircraft were omitted. For the study period, there were 130 accidents in which glare from natural sunlight was found to be a contributing factor. The majority of the events occurred during clear weather and atmospheric conditions (85\%), and were associated with approach/landing and takeoff/departure phases of flight (55\%). Exposure to glare from natural sunlight has contributed to aviation accidents, primarily under optimal visual conditions. The majority of accidents occurred during flight maneuvers at low altitude in airspace congested with other aircraft or obstacles, such as trees, power lines, utility poles, and terrain. Preventative techniques are presented that may protect a pilot's visual performance against the debilitating effects of glare from the sun.
Author
Aircraft Pilots; Aircraft Accidents; Pilot Performance; Risk; Glare; Sunlight; Impairment

20030056668 Gulhane Military Medical Academy Hospital, Ankara, Turkey, Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Prevalence of Selective Serotonin Reuptake Inhibitors in Pilot Fatalities of Civil Aviation Accidents, 1990-2001
Akin, Ahmet; Chaturvedi, Arvind K.; May 2003; 22 pp.; In English
Contract(s)/Grant(s): FAA-AM-B-02-TOX-202
Report No.(s): DOT/FAA/AM-03/7; No Copyright; Avail: CASI; A03, Hardcopy

Selective serotonin reuptake inhibitors (SSRIs) are popularly prescribed for treating depression. With a few exceptions, these psychotropic medications are not approved by aeromedical regulatory authorities for use by aviators. Since SSRIs have the potential for impairing performance and causing drug-drug interactions, the prevalence of SSRIs in pilot fatalities of civil aviation accidents was evaluated. Postmortem samples from pilots involved in fatal civil aircraft accidents are submitted to the Civil Aerospace Medical Institute (CAMI) for toxicological evaluation. Findings from such evaluations are maintained in the CAMI Toxicology Database. This database was examined for the presence of SSRIs in pilot fatalities of the accidents that occurred during 1990-2001. Out of 4184 fatal civil aviation accidents from which CAMI received samples, there were 61 accidents in which pilot fatalities had SSRIs. Of these accidents, 56 were of the general aviation category, 2 were of the air taxi and commuter category, 2 were of the agricultural category, and 1 was of the ultralight category. Blood concentrations of SSRIs in the fatalities were 11-1121 ng-mL(sup -1) for fluoxetine; 47-13102 ng-mL(sup -1) for sertraline; 68-1441 ng-mL(sup -1) for paroxetine; and 314-462 ng-mL(sup -1) for citalopram. In 39 of the 61 pilots, other drugs - for example analgesics, antihistaminics, benzodiazepines, narcotic analgesics, and/or sympathomimetics - and/or ethanol were also present. As determined by the National Transportation Safety Board, the use of an SSRI (with or without other drug(s) and/or ethanol) has been a contributory factor in at least 9 of the 61 accidents. Numbers of SSRI-involved accidents were low, and blood SSRI concentrations in the associated pilot fatalities ranged from subtherapeutic to toxic levels. However, the interactive effects of other drug(s), ethanol, and/or even hypoxia in producing adverse effects in the pilots cannot be ruled out. Findings from this study should be useful in investigating SSRI- and other substance-involved accidents and in making decisions concerning the use of SSRIs in aviation.

Author

Aircraft Accidents; Aircraft Pilots; Drugs; Ethyl Alcohol; Toxicology

20030056685 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

Human Factors Associated With the Certification of Airplane Passenger Seats: Life Preserver Retrieval

Gowdy, Van; DeWeese, Rick; May 2003; 16 pp.; In English; Original contains black and white illustrations

Report No.(s): DOT/FAA/AM-03/9; No Copyright; Avail: CASI; A03, Hardcopy

A series of human subject tests were conducted by the Biodynamics Research Team at the FAA's Civil Aerospace Medical Institute (CAMI) to investigate human factors associated with the easy reach requirement in FAA regulations for under-seat mounted life preservers. The protocol was designed to observe and measure the effects of human physical attributes and life preserver installation features relevant to the retrieval of life preservers. A mockup of a 30-inch pitch, economy class transport passenger seat installation was used to evaluate 4 configurations of life preserver installations. The position of the pull-strap, used to open the life preserver container, was the independent variable. One hundred thirty-two adult subjects were tested. Each subject was seated, restrained by the seat's lap belts,instructed to reach beneath the seat, open the lifer preserver container, and extract the packaged life preserver. The time for retrieval of the life vest was measured from videotapes of each test. The videotapes were also reviewed independently by 11 outside raters, who rated the difficulty for each subject on a scale of 1 (easy) to 7 (very dificult). There was significant agreement (Cronbach's alpha = 0.978) in the ease ratings. In comparing the ease ratings and retrieval times, an average ease rating less than 3 corresponded to a retrieval time less than 10 seconds. An 'EASY10' benchmark, derived from these results, indicates that a life preserver retrieval time less than 10 seconds should be considered easy. Two of the configurations had average ratings less than 3. The installation features that distinguish the two configurations that passed the EASY10 benchmark, compared with the two that failed, were the position of the pull-strap, the pull-angle on the strap necessary to effect a quick opening of the life preserver container, and the position of the stowed life preserver relative to the front frame of the seat. The results indicate that the easy reach criteria should be satisfied if: 1) the pull-strap and life preserver container are no more than 3-inches aft of the seat frame, and 2) the pull-angle to quickly open the container is in the range: -50 deg less than theta less than -10 deg.

Author

Human Factors Engineering; Seats; Survival Equipment; Passengers; Passenger Aircraft

20030056690 Civil Aerospace Medical Inst., Oklahoma City, OK, USA, OMNI Corp., Oklahoma City, OK, USA, Oklahoma City Univ., OK, USA

Examining Hypoxia: A Survey of Pilots' Experiences and Perspectives on Altitude Training

Hackworth, Carla A.; Peterson, Linda M.; Jack, Dan G.; Williams, Clara A.; Hodges, Blake E.; May 2003; 9 pp.; In English

Contract(s)/Grant(s): FAA-AM-A-02-HRR-521

Report No.(s): DOT/FAA/AM-03/10; Copyright; Avail: CASI; A02, Hardcopy

Federal aviation regulations and Advisory Circulars (ACs) provide requirements and guidance for high altitude physiological training for pilots and crewmembers. Pilots and crewmembers of flights exceeding 25,000 feet/mean sea level

(msl) are required to complete ground training in high-altitude physiology, including hypoxia training; however, regulations do not require altitude chamber training. The present research examined the training experiences and perceptions of pilots about the need for hypoxia training and altitude chamber training. Sixty-seven male pilots attending a meeting on aviation safety completed a survey assessing their experiences and perceptions of hypoxia training. All pilots indicated that they flew professionally and had logged hours flying for business during the six months prior to the survey date. Sixty-two pilots reported receiving hypoxia training, and of these, 71\% reported having initial altitude chamber training. Pilots reported that their training was informative (97\%) and that they would benefit from more hypoxia training (90\%). Pilots endorsed (agreed or strongly agreed) that all pilots should receive: introductory hypoxia training (92\%), recurrent hypoxia training (86\%), initial altitude chamber training (85\%), and recurrent altitude chamber training (70\%). However, when asked specifically if general aviation pilots flying unpressurized aircraft should receive initial altitude chamber training, only 31\% perceived this as being necessary. Initial altitude chamber training received lower endorsements for private (32\%) or recreational (10\%) pilots than for commercial (74\%) and air transport (90\%) pilots. When asked if altitude chamber training should be based on the altitude capability of an aircraft, 59\% responded affirmatively. It appears that the need for altitude chamber training was based on the likelihood of flying at higher altitudes and not simply the level of certification. When asked if the current regulations (i.e., not requiring altitude chamber training) addressing high-altitude flying (above 25,000 feet/msl) are sufficient, 52\% of the current sample disagreed or stronly disagreed. Generally, these professional pilots perceived that pilot training should include introductory hypoxia training, recurrent hypoxia training, and altitude chamber training. Noted exceptions were initial altitude chamber training for general aviation pilots flying unpressurized aircraft, recreational pilots, and private pilots. However, a caveat should be noted regarding the generalizability of these results. This sample is a small segment of the entire pilot population; therefore, these findings may not generalize to pilots overall. Distributing the survey to a wider audience of pilots would provide additional information regarding perceptions of hypoxia training.
Author
Aircraft Pilots; Pilot Ratings; Pilot Training; Altitude Simulation; High Altitude; Hypoxia

20030057134 Nebraska Univ., Omaha, NE, USA
Collegiate Aviation Research and Education Solutions to Critical Safety Issues
Bowen, Brent, Editor; April 2002; 54 pp.; In English; See also 20030057135 - 20030057143; Copyright; Avail: CASI; A04, Hardcopy

This Conference Proceedings is a collection of 6 abstracts and 3 papers presented April 19-20, 2001 in Denver, CO. The conference focus was 'Best Practices and Benchmarking in Collegiate and Industry Programs'. Topics covered include: satellite-based aviation navigation; weather safety training; human-behavior and aircraft maintenance issues; disaster preparedness; the collegiate aviation emergency response checklist; aviation safety research; and regulatory status of maintenance resource management.
CASI
Aircraft Safety; Conferences; Flight Safety; Air Navigation; Regulations

20030057135 Nebraska Univ., Omaha, NE, USA
Identification of Human Behavior and Aircraft Maintenance Safety Issues
Lu, Chien-Tsung; Collegiate Aviation Research and Education Solutions to Critical Safety Issues; April 2002; In English; See also 20030057134; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

During the past few decades, the Federal Aviation Administration, the National Transportation Safety Board, the National Aeronautics and Space Administration, aircraft manufacturers, and other safety advocate groups have conducted numerous research projects on the topic of human behavior. The majority of the research conducted was related to flight crew behavior. The main purpose of this project is to focus on human behavior issues related to maintenance technicians. The selected methodology, a survey, will be administered to maintenance personnel and the results analyzed to identfy needs for future human factors training.
Author
Human Behavior; Aircraft Maintenance; Ground Support Equipment; Human Performance

20030057136 Nebraska Univ., Omaha, NE, USA
Disaster Preparedness, Emergency Response and Curriculum
Schaaf, Michaela; Collegiate Aviation Research and Education Solutions to Critical Safety Issues; April 2002; In English; See also 20030057134; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Curriculum development can be achieved through the application of the research model. A new upper-level aviation course at the University of Nebraska at Omaha followed such a plan. The course, Airport Safety and Security, was conceived following the crash of TWA 800 and the subsequent White House Commission and the growing awareness of emergency planning and disaster response in aviation. The course was developed utilizing research into the curriculum needs in this area, including discussions with industry and government experts. The results of this research revealed components for inclusion, such as airport and ramp safety, OSHA requirements, risk assessment and management, disaster preparedness, emergency response plans, coordination among authorities, crisis communication, and passenger rights. The research also revealed that the structure of such a course lends itself to a seminar format and required many areas of expertise.
Author
Disasters; Education; Emergencies; Aircraft Safety

20030057139 Utah State Univ., Logan, UT, USA
Weather Safety Training for General Aviation Pilots through the use of Computer Flight Simulation
Widuaf, David; Collegiate Aviation Research and Education Solutions to Critical Safety Issues; April 2002; In English; See also 20030057134; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Flight into Instrument meteorological conditions is the leading cause of General Aviation fatal accidents. This has been a persistent trend over many years. This proposal offers a possible solution to reduce these fatal accidents. Indicated in the proposal is the use of Computer-Based Training (CBT) through existing Personal Computer Aviation Training Devices (PC-ATD). These PC simulators would be used to develop hands-on training scenarios for beginning pilots and recurrent training for experienced pilots. Pilots would be placed in simulated weather conditions they would not normally see and evaluate and improve their reactions to these scenarios. The conceptual design of this study is presented for expert participation in the conceptualization of research phase.
Author
Computer Assisted Instruction; Computerized Simulation; Flight Simulation; Pilot Training; Training Simulators; Weather; Aircraft Safety

20030057140 Nebraska Univ., Omaha, NE, USA
The Collegiate Aviation Emergency Response Checklist: Fundamental Pre-Crisis Planning
Fink, Mary; Larson, Michael; Collegiate Aviation Research and Education Solutions to Critical Safety Issues; April 2002; In English; See also 20030057134; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The University of Nebraska at Omaha Aviation Institute's commitment to the provision of a safe learning environment both in the classroom and in the air has led to the creation and adoption of an Emergency Response Checklist to be utilized in the event that a flight student is involved in an aircraft accident or incident. The plan came to fruition as the result of best practices research which examined crisis management plans at several regional flight training providers. Four Midwestern universities with aviation programs and one Air Force flying club were polled regarding current crisis procedures. At the time of the initial study, only one of the flight training providers possessed a crisis response plan. This plan outlines the roles of the flight vendor, as well as those of University of Nebraska at Omaha Campus Security, Student Affairs, University Relations, and the Aviation Institute. The goal of this plan is to eliminate uncertainty and assure that emergencies are responded to in an efficient manner with a clear and open flow of communication among all designated channels. As a result of this study, the Aviation Institute has implemented its own Emergency Response Checklist with all applicable university channels and contracted flight vendors. The outline of the checklist will be provided for review, comment and potential adoption by collegiate aviation flight training programs.
Author
Management Planning; Universities; Education; Emergencies

20030057141 Nebraska Univ., Omaha, NE, USA
Systemic Initiatives in Aviation Safety Research
Bowen, Brent; Collegiate Aviation Research and Education Solutions to Critical Safety Issues; April 2002; In English; See also 20030057134; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The scope of need in aviation safety research is daunting. Whenever we learn of tragedy we consider if, through enhanced knowledge, we could prevent another loss. At the University of Nebraska at Omaha Aviation Institute, a key tenet in our mission 'advocates the development of improved aviation/aerospace systems while furthering their integration into the overall modal transportation architecture.' Toward this charge, the enhancement of systemic safety in aviation is a priority in the

research directions undertaken. A review of the several ongoing aviation safety research projects at the Aviation Institute are presented and discussed in the interest of identifying collaboration opportunities. Integration of collegiate aviation resources in the area of safety education and research development will result in safety enhancements for the overall air transportation system.
Author
Aircraft Safety; Flight Safety; Research Management

20030057142 Nebraska Univ., Omaha, NE, USA
Current Regulatory Status In Regard To Maintenance Resource Management
Lu, Chien-tsung; Bowen, Brent; Collegiate Aviation Research and Education Solutions to Critical Safety Issues; April 2002; 16 pp.; In English; See also 20030057134; Copyright; Avail: CASI; A03, Hardcopy

The Federal Aviation Administration's (FAA) current Federal Aviation Regulations (FARs) do not explicitly require Maintenance Resource Management (MRM) training. Whilst the benefits of MRM training, which originated in human factors researches, have been recognized by the air industry and its mandatory implementation has been regulated by many aviation authorities such as those of Canada, UK, and European Union (EU) countries, the FAA in the USA retains its non-regulation stance. This situation has raised both curiosity and a research anxiety to discover the rationale underpinning such decision making. This white paper aims to explore related documents, up-to-date evidence and real-world perspectives in relation to MRM training. Consequently, the authors hope to generate research propositions and tentative theories for future policy study.
Author
Resources Management; Maintenance Training; Regulations; Aircraft Maintenance

20030057143 Nebraska Univ., Omaha, NE, USA
The Collegiate Aviation Emergency Response Checklist: Fundamental Pre-crisis Planning
Fink, Mary M.; Larson, Michael K.; Collegiate Aviation Research and Education Solutions to Critical Safety Issues; April 2002; 8 pp.; In English; See also 20030057134; Copyright; Avail: CASI; A02, Hardcopy

The University of Nebraska at Omaha Aviation Institute's commitment to the provision of a safe learning environment both in the classroom and in the air has led to the creation and adoption of an Emergency Response Checklist to be utilized in the event that a flight student is involved in an aircraft accident or incident. The plan came to fruition as the result of best practices research which examined crisis management plans at several regional flight training providers. Four Midwestern universities with aviation programs and one Air Force flying club were polled regarding current crisis procedures. At the time of the initial study, only one of the flight training providers possessed a crisis response plan. This plan outlines the roles of the flight vendor, as well as those of University of Nebraska at Omaha Campus Security, Student Affairs, University Relations, and the Aviation Institute. The goal of this plan is to eliminate uncertainty and assure that emergencies are responded to in an efficient manner with a clear and open flow of communication among all designated channels. As a result of this study, the Aviation Institute has implemented its own Emergency Response Checklist with all applicable university channels and contracted flight vendors. The outline of the checklist will be provided for review, comment and potential adoption by collegiate aviation flight training programs.
Author
Emergencies; Flight Training; Management Planning; Safety Management

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *06 Avionics and Aircraft Instrumentation, 17 Space Communications, Spacecraft Communications, Command and Tracking*, and *32 Communications and Radar*.

20030057138 Nebraska Univ., Omaha, NE, USA
Geographic North Versus Magnetic North to Provide Enhanced National Airspace System Safety
Larson, Michael K.; Collegiate Aviation Research and Education Solutions to Critical Safety Issues; April 2002; In English; See also 20030057134; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

One of the most dramatic changes in aviation navigation is taking place as the ground- based VOR is being replaced by the satellite-based GPS as the primary navigational facility in the National Airspace System (NAS). The most recent Federal Radionavigation Plan (FRP) proposes that by 2013 only a skeletal system of VOR/DMEs will serve in a supportive role to

the GPS based enroute navigation system. The capabilities of GPS present many potential enhancements to the efficacy and safety of the NAS. But, like many other high technology aircraft and flight systems, GPS can add complexity and, thus, workload for pilots. A concerted effort must be made to find means to simplify pilot operations in order to avoid work-overload conditions leading to loss of situational awareness. provided by a Geographic North based model versus the current Magnetic North based model. GPS receivers automatically provide position with respect to longitude and latitude and motion with respect to Geographic (True) North along a Great Circle track. Thus, with the GPS and a Geographic North based paradigm, procedures of converting true courses to magnetic headings by applying wind correction angles, magnetic variations, and magnetic deviations are no longer required. Additionally, magnetic disturbances and dip errors become irrelevant; and wind correction angle compensation becomes unnecessary for intercepting/tracking procedures and ATC vector. One such proposal takes advantage of the simpler navigation operation procedures

Author

Global Positioning System; Air Navigation; Pilot Performance; Workloads (Psychophysiology); Air Traffic Control; Situational Awareness; Radio Navigation; Vhf Omnirange Navigation

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information see also *18 Spacecraft Design, Testing and Performance*; and *39 Structural Mechanics*. For land transportation vehicles see *85 Technology Utilization and Surface Transportation*.

20030055618 NASA Glenn Research Center, Cleveland, OH, USA

Affordable Flight Demonstration of the GTX Air-Breathing SSTO Vehicle Concept

Krivanek, Thomas M.; Roche, Joseph M.; Riehl, John P.; Kosnareo, Daniel N.; April 2003; 20 pp.; In English; Combustion, Airbreathing Propulsion, Propulsion Systems Hazards, and Modelling and Simulation Subcommittees Joint Meeting, 8-12 Apr. 2002, Destin, FL, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 22-708-90-63

Report No.(s): NASA/TM-2003-212315; E-13316; NAS 1.15:212315; APS-III-22; No Copyright; Avail: CASI; A03, Hardcopy

The rocket based combined cycle (RBCC) powered single-stage-to-orbit (SSTO) reusable launch vehicle has the potential to significantly reduce the total cost per pound for orbital payload missions. To validate overall system performance, a flight demonstration must be performed. This paper presents an overview of the first phase of a flight demonstration program for the GTX SSTO vehicle concept. Phase 1 will validate the propulsion performance of the vehicle configuration over the supersonic and hypersonic air- breathing portions of the trajectory. The focus and goal of Phase 1 is to demonstrate the integration and performance of the propulsion system flowpath with the vehicle aerodynamics over the air-breathing trajectory. This demonstrator vehicle will have dual mode ramjetkcramjets, which include the inlet, combustor, and nozzle with geometrically scaled aerodynamic surface outer mold lines (OML) defining the forebody, boundary layer diverter, wings, and tail. The primary objective of this study is to demon- strate propulsion system performance and operability including the ram to scram transition, as well as to validate vehicle aerodynamics and propulsion airframe integration. To minimize overall risk and develop ment cost the effort will incorporate proven materials, use existing turbomachinery in the propellant delivery systems, launch from an existing unmanned remote launch facility, and use basic vehicle recovery techniques to minimize control and landing requirements. A second phase would demonstrate propulsion performance across all critical portions of a space launch trajectory (lift off through transition to all-rocket) integrated with flight-like vehicle systems.

Author

Rocket-Based Combined-Cycle Engines; Single Stage To Orbit Vehicles; Air Breathing Engines; Flight Tests; Reusable Launch Vehicles; Aircraft Design; Hypersonic Aircraft

20030055623 NASA Glenn Research Center, Cleveland, OH, USA

Simulation Model Development for Icing Effects Flight Training

Barnhart, Billy P.; Dickes, Edward G.; Gingras, David R.; Ratvasky, Thomas P.; April 2003; 20 pp.; In English; General Aviation Technology Conference and Exhibition 2002, 16-18 Apr. 2002, Wichita, KS, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 22-728-20-01

Report No.(s): NASA/TM-2003-212115; E-13767; NAS 1.15:212115; SAE-2002-01-1527; No Copyright; Avail: CASI; A03, Hardcopy

A high-fidelity simulation model for icing effects flight training was developed from wind tunnel data for the DeHavilland DHC-6 Twin Otter aircraft. First, a flight model of the un-iced airplane was developed and then modifications were generated to model the icing conditions. The models were validated against data records from the NASA Twin Otter Icing Research flight test program with only minimal refinements being required. The goals of this program were to demonstrate the effectiveness of such a simulator for training pilots to recognize and recover from icing situations and to establish a process for modeling icing effects to be used for future training devices.
Author
Flight Training; Aircraft Icing; Flight Tests; Wind Tunnel Tests; Aircraft Models; Flight Simulation; Aircraft Design

20030056588 Analex Corp., Brook Park, OH, USA
Comparison of Mars Aircraft Propulsion Systems
Kohout, Lisa, Technical Monitor; Colozza, Anthony J.; May 2003; 87 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS3-00145; WBS 22-708-87-11
Report No.(s): NASA/CR-2003-212350; E-13938; NAS 1.26:212350; No Copyright; Avail: CASI; A05, Hardcopy

The propulsion system is a critical aspect of the performance and feasibility of a Mars aircraft. Propulsion system mass and performance greatly influence the aircraft s design and mission capabilities. Various propulsion systems were analyzed to estimate the system mass necessary for producing 35N of thrust within the Mars environment. Three main categories of propulsion systems were considered: electric systems, combustion engine systems and rocket systems. Also, the system masses were compared for mission durations of 1, 2, and 4 h.
Author
Combustion; Propulsion System Performance; Propulsion System Configurations

20030057103 NASA Langley Research Center, Hampton, VA, USA
An Analysis of the Flapwise Bending Frequencies and Mode Shapes of Rotor Blades Having Two Flapping Hinges to Reduce Vibration Levels
Brooks, George W.; Leonard, H. Wayne; December 1960; 30 pp.; In English
Report No.(s): NASA-TN-D-633; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents the analysis of the flapwise natural bending frequencies and mode shapes of rotor blades with two flapping hinges located at arbitrary blade radii. The equations of motion are derived for a blade of variable mass and stiffness distribution. Solutions to the equations (natural frequencies and mode shapes) are presented for a typical blade of constant cross section having a wide range of hinge locations. The results show that the natural frequencies of the blades can be changed appreciably by varying the locations of the blade hinges, and that with two properly located flapping hinges, blade designs are possible which eliminate or greatly reduce conditions of resonance between the blade natural frequencies and the frequencies of the harmonic air loads. The results also show that ratios of natural frequency to rotor speed below a value of 6.0 are essentially constant for variations in rotor speed consistent with helicopter and VTOL applications.
Author
Flapping Hinges; Vibration Mode; Rotary Wing Aircraft; Bending; Resonant Frequencies; Rotor Aerodynamics; Rotor Blades (Turbomachinery)

20030057222 National Defence Research Establishment, Linkoeping, Sweden
Emitter Locating Using DDOA
Andersson, B.; Henriksson, D.; Lindgren, B.; Dec. 2001; In Swedish
Report No.(s): PB2003-103181; FOI-R-0329-SE; No Copyright; Avail: National Technical Information Service (NTIS)

In the last years a number of conflict situations have clearly shown the importance of airspace dominance. The duel between hostile mobile antiaircraft defense and own air force is therefore of great importance. In order to find the position of a mobile radar, a passive sensor can be used on a tactical aircraft. The estimated position can for example be used for SEAD, Suppression of Enemy Air Defense. Traditionally, systems for estimation of emitter positions required complex hardware, but new system architecture including advanced digital receiving processing has reduced the demands on hardware complexity extensively. This report starts with a description of an algorithm for emitter position estimation. It is based on accurate measurement of the emitter frequency and coarse management of the angle of arrival. Furthermore a number of parameters that affects the performance of the method are listed. Results from a measurements set-up are presented as well as results from computer simulations. The report also describes different aspects of the accurate frequency measurement method. The high performance of the algorithm used is a necessary condition for an accurate enough emitter position. The report is description

of the present status of the project. The research will continue during 2002.
NTIS
Emitters; Air Defense; Position (Location); Algorithms; Radar Detection

20030057282 Lawrence Livermore National Lab., Livermore, CA
Low-Cost Multi-Terrain Autonomous Vehicle for Hostile Environments
Perez, M. L.; Dec. 03, 1996; 16 pp.; In English
Report No.(s): DE2003-16398; UCRL-JC-124805; No Copyright; Avail: Department of Energy Information Bridge

This paper describes an innovative and unique autonomous vehicle being developed at the Lawrence Livermore National Laboratory (LLNL) for versatile use in hostile environments. Conventional vehicles used in decommissioning and decontaminating, police activity, and unmanned military opeations typically are designed with four-wheels or tracks in contact with the environment. Although four-wheel and track vehicles work well, they are limited in negotiating saturated terrain, steep hills and soft soils.
NTIS
Decommissioning; Remotely Piloted Vehicles

07
AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power; 28 Propellants and Fuels*; and *44 Energy Production and Conversion*.

20030055681 Toledo Univ., OH, USA
Sulfur Oxidation and Contrail Precursor Chemistry
DeWitt, Kenneth J.; April 2003; 33 pp.; In English
Contract(s)/Grant(s): NAG3-2674; NRA-01-GRC-02; WU 708-87-23
Report No.(s): NASA/CR-2003-212293; NAS 1.26:212293; E-13855; No Copyright; Avail: CASI; A03, Hardcopy

Sulfuric acid (H2SO4), formed in commercial aircraft operations via fuel-S (goes to) SO2 (goes to) SO3 (goes to) H2SO4 plays an important role in the formation of contrails. It is believed that the first step occurs inside the combustor, the second step in the engine exit nozzle, and the third step in the exhaust plume. Thus, measurements of the sulfur oxidation rates are critical to the understanding of contrail formation. Field measurements of contrails formed behind commercial aircraft indicate that significantly greater conversion of fuel-bound sulfur to sulfate aerosol occurs than can be explained by our current knowledge of contrail physics and chemistry. The conversion of sulfur from S(IV) to S(VI) oxidation state, required for sulfate aerosol formation, is thermodynamically favored for the conditions that exist within jet engines but is kinetically disfavored. The principal reaction pathway is O+SO2+M (goes to) SO3+M. The rates of this reaction have never been measured in the temperature and pressure regimes available to aircraft operation. In the first year (FY02) of this project, we performed a series of experiments to elucidate the rate information for the O+SO2+M (goes to) SO3+M reaction. The work performed is described following the proposed work plan. Because we used the H2/O2 system for an O-atom source and rate coefficients were obtained via computer simulation, construction of a reaction mechanism and either recalculation or estimation of thermodynamic properties of H(x)SO(y) species are described first.
Author
Contrails; Sulfur Dioxides; Oxidation; Reaction Kinetics; Combustion Chemistry

20030056587 Case Western Reserve Univ., Cleveland, OH, USA
Modeling of High-Strain-Rate Deformation, Fracture, and Impact Behavior of Advanced Gas Turbine Engine Materials at Low and Elevated Temperatures
Pereira, J. Mike, Technical Monitor; Shazly, Mostafa; Nathenson, David; Prakash, Vikas; May 2003; 36 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG3-2677; NSF CMS-99-08189; NSF CMS-00-79458; WU 708-87-23
Report No.(s): NASA/CR-2003-212194; E-13797; NAS 1.26:212194; No Copyright; Avail: CASI; A03, Hardcopy

Gamma titanium aluminides have received considerable attention over the last decade. These alloys are known to have low density, good high temperature strength retention, and good oxidation and corrosion resistance. However, poor ductility and low fracture toughness have been the key limiting factors in the full utilization of these alloys. More recently, Gamma-met

PX has been developed by GKSS, Germany. These alloys have been observed to have superior strengths at elevated temperatures and quasi-static deformation rates and good oxidation resistance at elevated temperatures when compared with other gamma titanium aluminides. The present paper discusses results of a study to understand dynamic response of gamma-met PX in uniaxial compression. The experiments were conducted by using a modified split Hopkinson pressure bar between room temperature and 900 C and strain rates of up to 3500 per second. The Gamma met PX alloy showed superior strength when compared to nickel based superalloys and other gamma titanium aluminides at all test temperatures. It also showed strain and strain-rate hardening at all levels of strain rates and temperatures and without yield anomaly up to 900 C. After approximately 600 C, thermal softening is observed at all strain rates with the rate of thermal softening increasing dramatically between 800 and 900 C. However, these flow stress levels are comparatively higher in Gamma met PX than those observed for other TiAl alloys.
Author
Gas Turbine Engines; Low Temperature; Strain Rate; Deformation; Fracture Mechanics; High Temperature Tests; Mathematical Models; Impact Tests; Mechanical Properties

20030057128 NASA Langley Research Center, Hampton, VA, USA
A Finite Rate Chemical Analysis of Nitric Oxide Flow Contamination Effects on Scramjet Performance
Cabell, Karen F.; Rock, Kenneth E.; January 05, 2003; 33 pp.; In English
Contract(s)/Grant(s): 706-51-31-10
Report No.(s): NASA/TP-2003-212159; NAS 1.60:212159; L-18226; No Copyright; Avail: CASI; A03, Hardcopy

The level of nitric oxide contamination in the test gas of the Langley Research Center Arc-Heated Scramjet Test Facility and the effect of the contamination on scramjet test engine performance were investigated analytically. A finite rate chemical analysis was performed to determine the levels of nitric oxide produced in the facility at conditions corresponding to Mach 6 to 8 flight simulations. Results indicate that nitric oxide levels range from one to three mole percent, corroborating previously obtained measurements. A three-stream combustor code with finite rate chemistry was used to investigate the effects of nitric oxide on scramjet performance. Results indicate that nitric oxide in the test gas causes a small increase in heat release and thrust performance for the test conditions investigated. However, a rate constant uncertainty analysis suggests that the effect of nitric oxide ranges from no net effect, to an increase of about 10 percent in thrust performance.
Author
Nitric Oxide; Chemical Analysis; Contamination; Test Facilities; Supersonic Combustion Ramjet Engines; Performance Tests; Combustion Chemistry

20030057235 Lawrence Livermore National Lab., Livermore, CA
Welding Metallurgy of Nickel Alloys in Gas Turbine Components
Lingenfelter, A. C.; May 21, 1997; 14 pp.; In English
Report No.(s): DE2003-16395; UCRL-JC-127532; No Copyright; Avail: Department of Energy Information Bridge

Materials for gas turbine engines are required to meet a wide range of temperature and stress application requirements. These alloys exhibit a combination of creep resistance, creep rupture strength, yield and tensile strength over a wide temperature range, resistance to environmental attack (including oxidation, nitridation, sulphidation and carburization), fatigue and thermal fatigue resistance, metallurgical stability and useful thermal expansion characteristics. These properties are exhibited by a series of solid-solution strengthened and precipitation-hardened nickel, iron and cobalt alloys. The properties needed to meet the turbine engine requirements have been achieved by spedfic alloy additions, by heat treatment and by thermal mechanical processing. A thorough understanding of the metallurgy and metallurgical processing of these materials is imperative in order to successfully fusion weld them. This same basic understanding is required for repair of a component with the added dimension of the potential effects of thermal cycling and environmental exposure the component will have endured in service. This article will explore the potential problems in joining and repair welding these materials.
NTIS
Nickel Alloys; Welding; Metallurgy; Gas Turbine Engines

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see *03 Air Transportation and Safety*. For astronautical facilities see *14 Ground Support Systems and Facilities (Space)*.

20030055620 NASA Glenn Research Center, Cleveland, OH, USA

A Programmable System for Motion Control

Nowlin, Brent C.; April 2003; 20 pp.; In English; 49th International Instrumentation Symposium, 4-8 May 2003, Orlando, FL, USA; Original contains color illustrations

Report No.(s): NASA/TM-2003-212377; E-13954; NAS 1.15:212377; No Copyright; Avail: CASI; A03, Hardcopy

The need for improved flow measurements in the flow path of aeronautics testing facilities has led the NASA Glenn Research Center to develop a new motion control system. The new system is programmable, offering a flexibility unheard of in previous systems. The motion control system is PLC-based, which leads to highly accurate positioning ability, as well as reliability. The user interface is a software-based HMI package, which also adds flexibility to the overall system. The system also has the ability to create and execute motion profiles. This paper discusses the system's operation, control implementation, and experiences.

Author

Test Facilities; Programmable Logic Devices; Systems Engineering; Motion; Servomotors; Automatic Control

20030055630 NASA Glenn Research Center, Cleveland, OH, USA

Development and Utility of a Piloted Flight Simulator for Icing Effects Training

Ratvasky, Thomas P.; Ranaudo, Richard J.; Barnhart, Billy P.; Dickes, Edward G.; Gingras, David R.; April 2003; 14 pp.; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 22-728-20-01

Report No.(s): NASA/TM-2003-212116; E-13768; NAS 1.15:212116; AIAA Paper 2003-0022; Copyright; Avail: CASI; A03, Hardcopy

A piloted flight simulator called the Ice Contamination Effects Flight Training Device (ICEFTD), which uses low cost desktop components and a generic cockpit replication is being developed. The purpose of this device is to demonstrate the effectiveness of its use for training pilots to recognize and recover from aircraft handling anomalies that result from airframe ice formations. High-fidelity flight simulation models for various baseline (non-iced) and iced configurations were developed from wind tunnel tests of a subscale DeHavilland DHC-6 Twin Otter aircraft model. These simulation models were validated with flight test data from the NASA Twin Otter Icing Research Aircraft, which included the effects of ice on wing and tail stall characteristics. These simulation models are being implemented into an ICEFTD that will provide representative aircraft characteristics due to airframe icing. Scenario-based exercises are being constructed to give an operational-flavor to the simulation. Training pilots will learn to recognize iced aircraft characteristics from the baseline, and will practice and apply appropriate recovery procedures to a handling event.

Author

Aircraft Icing; Flight Simulation; Flight Simulators; Aircraft Pilots; Aerodynamic Stalling; Computer Programs

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also *09 Research and Support Facilities (Air)*.

20030055691 NASA Ames Research Center, Moffett Field, CA, USA

Procedure Visualization to Augment Space Mission Training

McIntosh, Dawn M.; Elcott, Sharif; Betts, Bradley J.; Mah, Robert W.; [2003]; 5 pp.; In English; 40th Space Congress, 1 May 2003, Cocoa Beach, FL, USA; Copyright; Avail: CASI; A01, Hardcopy

The Intelligent Virtual Station (IVS) has been developed by the Smart Systems Research Laboratory at the NASA Ames Research Center as a solution to some of the training and operations challenges faced by organizations like the International Space Station training facilities and Mission Control engineering teams. At present, astronaut crews are constrained by limited

access to physical mockups, which themselves have a built-in 1-g limitation. Mission operations team are faced with the daunting task of controlling the operations and maintenance of an ever-changing Station in space. Many operations teams create and follow textual procedures without the ability to visualize the given actions or alternatives. The NS allows users to easily generate and view procedures to enhance training and operations. Because training and mission operations are of crucial importance to the International Space Station and other similarly sophisticated programs, this paper is focused on the NS integrated procedure tool.
Author
Space Flight Training; Training Simulators; Virtual Reality; Human-Computer Interface; Computerized Simulation; Scene Generation; Space Environment Simulation

16
SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety; 15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20030056708 NASA Kennedy Space Center, Cocoa Beach, FL, USA
STS-96 Meal - Suit Up - Depart O and C C7 Discovery Launch - On Orbit - Landing - Isos
June 06, 1999; In English; No Copyright; Avail: CASI; V03, Videotape-VHS; B03, Videotape-Beta

Footage of various stages of the STS-96 (Commander Kent Rominger; Pilot Rick Husband; Mission Specialist 1 Tamara Jernigan; Mission Specialist 2 Ellen Ochoa; Mission Specialist 3 Daniel Barry; Mission Specialist 4 Julie Payette; Mission Specialist 5 Valery Tokarev) Discovery launch is shown, including shots of the crew at breakfast, getting suited up, and departing to board the Orbiter. The launch and the landing are seen from many vantage points. On-board activities shown include: the approach and docking with the International Space Station, the payload transfer, the entering of the International Space Station Unity module, and the undocking of the Discovery from the International Space Station.
CASI
Space Transportation System; International Space Station; Spacecraft Docking; Spacecraft Launching; Spacecraft Landing; Crew Procedures (Preflight); Crew Procedures (Inflight); Discovery (Orbiter)

20030057146 NASA Kennedy Space Center, Cocoa Beach, FL, USA
STS-112/Atlantis/ISS 9A Pre-Launch - Launch On-Orbit - Landing - Crew Egress
October 18, 2002; In English; No Copyright; Avail: CASI; V04, Videotape-VHS; B04, Videotape-Beta

The video starts with an introduction of the crew of Space Shuttle Atlantis on STS-112 at their customary pre-flight meal. The crew consists of Commander Jeffrey Ashby, Pilot Pam Melroy, and Mission Specialists David Wolf, Sandra Magnus, Piers Sellers, and Fyodor Yurchikhin. The crew is then shown during suit-up, while exiting the Operations and Checkout Building to board the Astrovan, and during ingress and seating. Launch views include: Beach Tracker, VAB, PAD-B, Tower-1, DLTR-3, Grandstand, Cocoa Beach DOAMS, Playalinda DOAMS, UCS-23, OTV-170, OTV-171, and External Tank Camera. On-orbit footage includes the Atlantis orbiter docking with the ISS (International Space Station). The video shows clips of extravehicluar activities (EVAs), and some of the tasks performed during the mission. Footage included shows the installation of the S1 Truss onto the ISS with the Space Station Remote Manipulator System (Canadarm 2), Canadarm 2 carrying the Ammonia Tank Assembly prior to connection, the checkout of the Thermal Radiator Rotary Joint, the soft docking of an S-Band antenna, and the deployment of the S1 Radiator. An onboard repair of the ISS humidity separator is also shown. Landing views include: VAB, Tower 1, Mid-Field, Runway South End, Runway North End, Tower-2, Cocoa Beach DOAMS, and PPOV. Kennedy Space Center managers greet the crew upon arrival, and Commander Ashby gives a brief speech while standing with his crew members.
CASI
Atlantis (Orbiter); Spacecrews; Liftoff (Launching); International Space Station; Integrated Truss Structure S1; Orbital Assembly; Horizontal Spacecraft Landing

20030057147 NASA Kennedy Space Center, Cocoa Beach, FL, USA
STS-92 Meal - Suit up - Depart O&C - Launch Discovery On Orbit - Landing - Crew Egress
October 24, 2000; In English; No Copyright; Avail: CASI; V03, Videotape-VHS; B03, Videotape-Beta

The video begins with the introduction of the crew of Space Shuttle Discovery on STS-92, at their customary pre-flight

meal. The crew consists of Commander Brian Duffy, Pilot Pamela Melroy, and Mission Specialists Leroy Chiao, William McArthur, Peter 'Jeff' Wisoff, Michael Lopez-Alegria, and Koichi Wakata. The introduction and suit-up of the astronauts, and their departure in the Astrovan are shown at a quick pace. The video shows in detail the seating of the crew and each astronaut's final preparations in the White Room prior to boarding. Views of Discovery's night launch include: SLF Convoy, Beach Tracker, VAB, Pad Perimeter, Tower-1, UCS-15, Press Site, UCS-23, OTV-61, OTV-70, OTV-71, and the In-Cabin Ascent Camera. While in orbit, the Discovery orbiter docks with the International Space Station (ISS). The docking is shown in a series of still images. The video includes clips from four extravehicular activities (EVAs). The crew members who performed the EVAs comment on them while speaking to Mission Control. During the EVAs, the Z1 Truss and an antenna are attached to the ISS. The crew members on the fourth EVA test jet packs. Views of landing include: TV-1, TV-2, TV-3, LRO-1, and HUD.
Author
Discovery (Orbiter); Spacecrews; Liftoff (Launching); Spacecraft Docking; International Space Station; Extravehicular Activity; Horizontal Spacecraft Landing

20030057262 NASA Kennedy Space Center, Cocoa Beach, FL, USA
STS-113/Endeavour/ISS 11A Pre-Launch - Launch On Orbit - Landing - Crew Egress
December 07, 2002; In English; No Copyright; Avail: CASI; V04, Videotape-VHS; B04, Videotape-Beta

The crew of STS-113 and the Expedition 6 crew of the International Space Station (ISS) are introduced leaving the suitup room and while being assisted in their seats onboard Space Shuttle Endeavour. The shuttle's crew consisted of Commander Jim Wetherbee, Pilot Paul Lockhart and Mission Specialists Michael Lopez-Alegria and John Herrington. The Expedition 6 crew consisted of Commander Ken Bowersox, Flight Engineer Nikolai Budarin and NASA ISS Science Officer Don Pettit. Clips of the Endeavour's night launch are shown from these cameras: Beach Tracker, VAB, Pad A, OTV-60, OTV-70, Tower 1, UCS-15, Press Site Grandstand, Cocoa Beach DOAMS, Playalinda Beach DOAMS, UCS-23, and the In-Cabin Camera. While on-orbit, highlights include the docking of Endeavour with the ISS, the Change of Command Ceremony by the Expedition 5 and 6 crews of the ISS, the mating of the P1 and S0 Trusses, and three extravehicular activities (EVAs) by astronauts Lopez-Allegria and Herrington. The shuttle crew also repairs a leak in the onboard Carbon Dioxide Removal Assembly. Clips of the shuttle's landing are shown from these cameras: VAB, Tower 1, Midfield, Runway South End, Runway North End, Tower 2, Playalinda DOAMS, UCS-3 Infrared, UCS-23, Midfield Infrared, and Pilot Point of View (PPOV).
CASI
Endeavour (Orbiter); Spacecrews; International Space Station; Spacecraft Launching; Horizontal Spacecraft Landing; Spacecraft Docking; Extravehicular Activity; Orbital Assembly

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information see also *04 Aircraft Communications and Navigation*; and *32 Communications and Radar*.

20030055629 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Results from the GPS Flight Experiment on the High Earth Orbit AMSAT OSCAR-40 Spacecraft
Bauer, Frank, Technical Monitor; Moreau, Michael C.; Davis, Edward P.; Carpenter, J. Russell; Kelbel, David; Davis, George W.; Axelrad, Penina; [2002]; 12 pp.; In English; ION GPS 2002, 24-27 Sep.2002, Portland, OR, USA; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

A GPS receiver flying on the High Earth Orbit (HEO) AMSAT-OSCAR 40 (AO-40) spacecraft has been returning GPS observations from high above the altitude of the GPS constellation. AO-40, an amateur radio satellite launched November 16, 2000, is currently in a low inclination, 1000 by 59000 lan altitude orbit. This low-cost experiment utilizes a mid 1990's era, 6-channel, CIA code receiver configured with high gain receiving antennas for tracking above the GPS constellation. The receiver has performed well, despite operating significantly outside of its original design environment. It has regularly returned GPS observations from points all around the orbit, with over ten weeks of GPS tracking data collected to date. Signal to noise levels as high as 48 B-Hz have been recorded near apogee, when the spacecraft was at an altitude of close to 60000 km. GPS side lobe signals have been tracked on several occasions, primarily from Block IIR GPS satellites. Although the receiver has not computed a solution in real-time, point solutions have been computed on the ground using simultaneous measurements from four satellites. This experiment has provided important experience dealing with the many challenges inherent to GPS

tracking at high altitudes, and the measurements returned are providing valuable information about the characteristics of GPS signals available for future HE0 users.
Author
Global Positioning System; Earth Orbits; High Gain

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 Avionics and Aircraft Instrumentation*; for spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; for spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

20030055669 NASA Ames Research Center, Moffett Field, CA, USA
Integrated Demonstration of Instrument Placement , Robust Execution and Contingent Planning
Pedersen, L.; Bualat, M.; Lees, D.; Smith, D. E.; Korsmeyer, David, Technical Monitor; Washington, R.; March 17, 2003; 7 pp.; In English; ISARAS, 19-24 May 2003, Nara, Japan; Original contains color and black and white illustrations; Copyright; Avail: CASI; A02, Hardcopy

This paper describes an integrated demonstration of ground-based contingent planning, robust execution and autonomous instrument placement for the efficient exploration of a site by a prototype Mars rover.
Author
Mars Surface; Roving Vehicles; Instrument Orientation

20
SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

20030056589 Colorado State Univ., Fort Collins, CO, USA
Xenon Sputter Yield Measurements for Ion Thruster Materials
Rawlin, Vincent K., Technical Monitor; Williams, John D.; Gardner, Michael M.; Johnson, Mark L.; Wilbur, Paul J.; May 2003; 18 pp.; In English; 28th International Electric Propulsion Conference, 17-21 Mar. 2003, Toulouse, France; Original contains color illustrations
Contract(s)/Grant(s): NAG3-1801; WBS 800-50-01
Report No.(s): NASA/CR-2003-212306; E-13883; NAS 1.26:212306; No Copyright; Avail: CASI; A03, Hardcopy

In this paper, we describe a technique that was used to measure total and differential sputter yields of materials important to high specific impulse ion thrusters. The heart of the technique is a quartz crystal monitor that is swept at constant radial distance from a small target region where a high current density xenon ion beam is aimed. Differential sputtering yields were generally measured over a full 180 deg arc in a plane that included the beam centerline and the normal vector to the target surface. Sputter yield results are presented for a xenon ion energy range from 0.5 to 10 keV and an angle of incidence range from 0 deg to 70 deg from the target surface normal direction for targets consisting of molybdenum, titanium, solid (Poco) graphite, and flexible graphite (grafoil). Total sputter yields are calculated using a simple integration procedure and comparisons are made to sputter yields obtained from the literature. In general, the agreement between the available data is good. As expected for heavy xenon ions, the differential and total sputter yields are found to be strong functions of angle of incidence. Significant under- and over-cosine behavior is observed at low- and high-ion energies, respectively. In addition, strong differences in differential yield behavior are observed between low-Z targets (C and Ti) and high-Z targets (Mo). Curve fits to the differential sputter yield data are provided. They should prove useful to analysts interested in predicting the erosion profiles of ion thruster components and determining where the erosion products re-deposit.
Author
Xenon; Sputtering; Ion Engines; Thrust Measurement; High Impulse; Ion Sources

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20030055667 Cleveland State Univ., Cleveland, OH, USA
Physical Properties and Durability of New Materials for Space and Commercial Applications
Hambourger, Paul D.; June 03, 2003; 6 pp.; In English
Contract(s)/Grant(s): NCC3-740; No Copyright; Avail: CASI; A02, Diskette; A02, Hardcopy

To develop and test new materials for use in space power systems and related space and commercial applications, to assist industry in the application of these materials, and to achieve an adequate understanding of the mechanisms by which the materials perform in their intended applications.

Author

Spacecraft Power Supplies; Materials Tests; Physical Properties; Protective Coatings; Carbon Fibers; Radiation Effects

20030057225 Wichita State Univ., Wichita, KS, USA
Analytical Modeling of ASTM Lap Shear Adhesive Specimens
Yang, C.; Tomblin, J. S.; Guan, Z.; Feb. 2003; In English
Report No.(s): PB2003-104281; No Copyright; Avail: National Technical Information Service (NTIS)

An analytical model was developed to predict the stress distribution within the specimen specified in ASTM D 3165 'Strength Properties of Adhesives in Shear by Tension Loading of Single-Lap-Joint Laminated Assemblies.' In the developed model, the composite adherends were assumed elastic orthotropic, and the adhesive was assumed elastic-perfectly plastic. Experimental joint strength data was used in conjunction with the developed model to define the failure criterion for cohesive failure mode. Finite element analyses were conducted to simulate the behavior of both ASTM D 5656 'Standard Test Method for Thick- Adherend Metal Lap-Shear Joints for Determination of the Stress-Strain Behavior of Adhesives in Shear by Tension Loading' and ASTM D 3165 test specimens for deformation, stress distribution, and failure. In the finite element models, aluminum adherends were assumed elastic-perfectly plastic, and the adhesive stress-strain relation was determined by trial calculations of ASTM D 5656 specimens and comparison to experimental results. Both the equivalent plastic strain criterion and the fracture mechanics approach with J-integral were used as failure criteria. Predicted joint strengths were compared with experimental data.

NTIS

Adhesive Bonding; Stress Distribution; Metal Joints; Stress-Strain Relationships; Adhesives

20030057231 Lawrence Livermore National Lab., Livermore, CA
High-Precision Reflectometry of Multilayer Coatings for Extreme Ultraviolet Lithography
Wedowski, M.; Underwood, J. H.; Gullikson, E. M.; Bajt, S.; Folta, J. A.; Dec. 20, 1999; 18 pp.; In English
Report No.(s): DE2003-15002502; UCRL-JC-136871; No Copyright; Avail: Department of Energy Information Bridge

Synchrotron-based reflectometry is an important technique for the precise determination of optical properties of reflective multilayer coatings for Extreme Ultraviolet Lithography (EUVL). Multilayer coatings enable normal incidence reflectances of more than 65\% in the wavelength range between 11 and 15 nm. In order to achieve high resolution and throughput of EUVL systems, stringent requirements not only apply to their mechanical and optical layout, but also apply to the optical properties of the multilayer coatings. Therefore, multilayer deposition on near-normal incidence optical surfaces of projection optics, condenser optics and reflective masks requires suitable high-precision metrology. Most important, due to their small bandpass on the order of only 0.5 nm, all reflective multilayer coatings in EUVL systems must be wavelength-matched to within H.05 nm. In some cases, a gradient of the coating thickness is necessary for wavelength matching at variable average angle of incidence in different locations on the optical surfaces. Furthermore, in order to preserve the geometrical figure of the optical substrates, reflective multilayer coatings need to be uniform to within 0.01 nm in their center wavelength. This requirement can only be fulfilled with suitable metrology, which provides a precision of a fraction of this value. In addition, for the detailed understanding and the further development of reflective multilayer coatings a precision in the determination of peak reflectances is desirable on the order of 0.1\%. Substrates up to 200 mm in diameter and 15 kg in mass need to be accommodated. Above requirements are fulfilled at beamline 6.3.2 of the Advanced Light Source (ALS) in Berkeley. This

beamline proved to be precise within 0.2\% (ms) for reflectance and 0.002 nm (rms) for wavelength.
NTIS
Antireflection Coatings; Ultraviolet Emission; Lithography; Synchrotrons; Optical Properties

20030057283 Delaware Univ., Newark, DE, USA
Optimization of Processing and Modeling Issues for Thin-Film Solar Cell Devices
Birkmire, R. W.; Phillips, J. E.; Shafarman, W. N.; Hegedus, S. S.; McCandless, B. E.; Nov. 1998; In English
Report No.(s): DE2003-6700; No Copyright; Avail: National Technical Information Service (NTIS)

The overall mission of the Institute of Energy Conversion is the development of thin film photovoltaic cells, modules, and related manufacturing technology and the education of students and professionals in photovoltaic technology. The objectives of this four-year NREL subcontract are to advance the state of the art and the acceptance of thin film PV modules in the areas of improved technology for thin film deposition, device fabrication, and material and device characterization and modeling, relating to solar cells based on CuInSe(sub 2) and its alloys, on a-Si and its alloys, and on CdTe.
NTIS
Cadmium Tellurides; Copper Selenides; Gallium Selenides; Indium Selenides; Solar Cells

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20030057226 Federal Aviation Administration, Washington, DC
Guidelines and Recommended Criteria for the Development of a Material Specification for Carbon Fiber/Epoxy Unidirectional Prepegs
Mar. 2003; 72 pp.; In English
Report No.(s): PB2003-104284; DOT/FAA/AR-02/109; No Copyright; Avail: CASI; A04, Hardcopy

This report establishes recommendations to guide the development of composite prepreg material specifications. This is intended to advance the work that has been done through previous Federal Aviation Administration and National Aeronautics and Space Administration programs such as the Advanced General Aviation Transport Experiment. These programs have established methodologies for developing design allowable data, control of the data, and sharing the resulting database. In the current work, a generalized approach to the development of a shared composite material database is proposed. It is intended to remove the restrictions placed on those general aviation methods to allow a broader market to use the shared database. This document recommends guidance and criteria for the development of material specifications for carbon fiber/epoxy unidirectional prepreg tape materials to be used on aircraft structures. These recommendations were prepared by a team of industry experts. The guidelines and recommendations are meant to be a documentation of current knowledge and application of sound engineering principles to the development and implementation of composite material procurement specifications. A list of material control areas needing improvement and enhancement is given in appendix A. This document can also be used to develop common industry specifications.
NTIS
Prepregs; Epoxy Matrix Composites; Composite Materials; Fiber Composites

25
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90 Astrophysics*.

20030055622 NASA Glenn Research Center, Cleveland, OH, USA
Evaluation of the Tribological Behavior of Krytox 143AB With Nano-Onions
Street, Kenneth W.; Marchetti, Mario; Vander Wal, Randy L.; Tomasek, Aaron J.; April 2003; 14 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-975; WBS 22-708-87-14; NRA 99-HEDS-01
Report No.(s): NASA/TM-2003-212301; NAS 1.15:212301; E-13872; No Copyright; Avail: CASI; A03, Hardcopy

Nanoparticles have been widely developed over the past ten years and have found several applications. This work presents the use of carbon nano-onions, i.e. nanoparticles, as a potential additive in an oil for aerospace application. It was shown that these particles can provide adequate lubrication very similar to graphitic material.
Author
Nanoparticles; Tribology; Raman Spectroscopy; Oil Additives

20030057166 Lawrence Livermore National Lab., Livermore, CA
Thermodynamic Study of UO3(g), UO2(OH)2(g),UO2Cl2(g), and UO2F2(g)
Ebbinghaus, B. B.; Krikorain, O. H.; Fleming, D. L.; Nov. 07, 2002; 40 pp.; In English
Report No.(s): DE2003-15002517; UCRL-ID-150979; No Copyright; Avail: Department of Energy Information Bridge

As part of a study on actinide volatility in incineration and other thermal processes for treatment of mixed waste, the volatility of uranium oxide in the presence of oxygen and water vapor and in the presence of oxygen and chlorine have been measured. Volatility and particle entrainment are the two main sources of possible metal emissions from incinerators and other thermal oxidation processors. A material which volatilizes in a thermal oxidizer will recondense in the offgas preferentially on fine fly ash particulates and as aerosols. These are generally more difficult to capture with air pollution control devices than the larger fly ash particulates. Therefore, the volatility of radioactive materials in thermal processes is very important in assessing the likelihood of radioactive emissions to the atmosphere.
NTIS
Uranium Oxides; Volatility; Chlorine; Thermodynamic Properties; Uranium Fluorides; Radioactive Materials

20030057188 Fluor Daniel Hanford, Inc., Richland, WA, USA
Basis Document for Thermal Stabilization
Risenmay, H. R.; Jun. 18, 2001; 108 pp.; In English
Report No.(s): DE2003-807149; HNF-SD-CP-OCD-040-REV-4; No Copyright; Avail: Department of Energy Information Bridge

The HC-21C and HA-211 gloveboxes will be used to stabilize plutonium bearing material. This will be accomplished by heating plutonium oxide, plutonium metal or alloy, magnesium hydroxide precipitated plutonium or plutonium/uranium oxide/hydroxide, reactive incinerator ash, oxalate precipitated plutonium or plutonium/uranium, plutonium oxalate conversion product (oxycarbonate from previous processing in RMNRMC lines). Heating to a temperature of 1000 degrees centigrade in an air stream will drive off residual volatile components and convert residual plutonium-bearing materials to PuO(sub 2). This technical basis covers the Operation Specification Document (OSD-Z-184-00006) and explains the limits necessary for criticality prevention, protection of personnel and environmental safety, minimizing equipment damage, and attempting to maximize process efficiency.
NTIS
Uranium Oxides; Thermal Stability

20030057243 Lawrence Livermore National Lab., Livermore, CA
Detailed Chemical Kinetic Mechanisms for Combustion of Oxygenated Fuels
Fisher, E. M.; Pitz, W. J.; Curran, H. J.; Westbrook, C. K.; Jan. 11, 2000; In English
Report No.(s): DE2003-791028; UCRL-JC-137097; No Copyright; Avail: National Technical Information Service (NTIS)

Thermodynamic properties and detailed chemical kinetic models have been developed for the combustion of two oxygenates: methyl butanoate, a model compound for biodiesel fuels, and methyl formate, a related simpler molecule. Bond additivity methods and rules for estimating kinetic parameters were adopted from hydrocarbon combustion and extended. The resulting mechanisms have been tested against the limited combustion data available in the literature, which was obtained at low temperature, subatmospheric conditions in closed vessels, using pressure measurements as the main diagnostic. Some qualitative agreement was obtained, but the experimental data consistently indicated lower overall reactivities than the model, differing by factors of 10 to 50. This discrepancy, which occurs for species with well-established kinetic mechanisms as well as for methyl esters, is tentatively ascribed to the presence of wall reactions in the experiments. The model predicts a region of weak or negative dependence of overall reaction rate on temperature for each methyl ester. Examination of the reaction fluxes provides an explanation of this behavior, involving a temperature dependent competition between chain-propagating unimolecular decomposition processes and chain-branching processes, similar to that accepted for hydrocarbons.
NTIS
Chain Reactions (Chemistry); Combustion; Oxygenation; Reaction Kinetics; Diesel Fuels; Thermodynamic Properties

20030057250 Iowa State Univ. of Science and Technology, Ames, IA
Electrocatalytic Materials and Techniques for the Anodic Oxidation of Various Organic Compounds
Treiemr, S. E.; Jan. 2001; 122 pp.; In English
Report No.(s): DE2003-803741; No Copyright; Avail: Department of Energy Information Bridge

The focus of this thesis was first to characterize and improve the applicability of Fe(III) and Bi(V) doped PbO(sub 2) film electrodes for use in anodic O-transfer reactions of toxic and waste organic compounds, e.g. phenol, aniline, benzene, and naphthalene. Further, they investigated the use of alternative solution/electrode interfacial excitation techniques to enhance the performance of these electrodes for remediation and electrosynthetic applications. Finally, they have attempted to identify a less toxic metal oxide film that may hold promise for future studies in the electrocatalysis and photoelectrocatalysis of O-transfer reactions using metal oxide film electrodes.
NTIS
Electrocatalysts; Anodes; Oxidation; Waste Treatment

20030057292 Lawrence Livermore National Lab., Livermore, CA
Scaled Thermal Explosion Experiment
Wardell, J. F.; Maienschein, J. L.; Jul. 05, 2002; 16 pp.; In English
Report No.(s): DE2003-15002746; UCRL-JC-144614; No Copyright; Avail: Department of Energy Information Bridge

We have developed the Scaled Thermal Explosion Experiment (STEX) to provide a database of reaction violence from thermal explosion for explosives of interest. Such data are needed to develop, calibrate, and validate predictive capability for thermal explosions using simulation computer codes. A cylinder of explosive 25, 50 or 100 mm in diameter, is confined in a steel cylinder with heavy end caps, and heated under controlled conditions until reaction. Reaction violence is quantified through non-contact micropower impulse radar measurements of the cylinder wall velocity and by strain gauge data at reaction onset. Here we describe the test concept, design and diagnostic recording, and report results with HMX- and RDX-based energetic materials.
NTIS
Explosions; Experimentation; Thermodynamic Properties; Explosives

26
METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20030055621 Northwestern Univ., Evanston, IL, USA
Synthesis, Microstructure and Properties of Nickel Aluminide Foams
Dunand, David C.; [2003]; 5 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-870; No Copyright; Avail: CASI; A01, Hardcopy

Two Ph.D. students were involved in the project: Mr. Christopher Schuh (part-time, graduated in Spring 2001) and Ms. Andrea Hodge (full-time, graduated Summer 2002). One post-doctoral fellow, Dr. Heeman Choe, worked full-time on the project from July to December 2002. A new process to aluminize and chromize nickel foams was created. A kinetic aluminization model was developed. Creep testing was conducted on the foams. A finite-element model and a simplified analytical model for foam creep were produced. Four articles were written: one is published, two are accepted for publication, and one is in preparation. Ms. Hodge spent four months at NASA Glenn Research Center (9-12/2001 and 2-3/2002) under the supervision of Dr. Nathal. She conducted research on NiAl foam fabrication, mechanical testing and numerical modeling. She gave a talk at the ASM annual conference in November 2001 and presented her results at NASA in December 2001.
Author
Technology Assessment; Aluminum Coatings; Chromium Alloys; Nickel Aluminides; Foams; Creep Properties; Finite Element Method; Mathematical Models

20030055683 Cleveland State Univ., Cleveland, OH, USA
Electrical Properties and Manufacturability of ITO-MgF2 and Related Transparent Arcproof Spacecraft Coatings
Hambourger, Paul D.; June 03, 2003; 3 pp.; In English
Contract(s)/Grant(s): NCC3-1023; No Copyright; Avail: CASI; A02, Diskette; A01, Hardcopy

To investigate the applicability of co-deposited indium tin oxide and magnesium fluoride as a transparent arcproof coating on the exterior of PowerSphere microsatellites. This included testing coating performance after deposition on flexible

polymeric substrates, determining whether ultraviolet (UV) radiation present during deposition might affect the UV-curing resin contained in the substrate, and preparation of coated polymeric samples for radiation damage studies by the PowerSphere team.
Author
Protective Coatings; Electrical Properties; Indium Compounds; Tin Oxides; Magnesium Fluorides; Deposition; Microsatellites

20030056633 Boeing Co., Seattle, WA, USA
Superplastic Forming/Adhesive Bonding of Aluminum (SPF/AB) Multi-Sheet Structures
Wagner, John A., Technical Monitor; Will, Jeff D.; Cotton, James D.; May 2003; 14 pp.; In English
Contract(s)/Grant(s): NAS1-99070; 721-21-18-06
Report No.(s): NASA/CR-2003-212400; NAS 1.26:212400; No Copyright; Avail: CASI; A03, Hardcopy

A significant fraction of airframe structure consists of stiffened panels that are costly and difficult to fabricate. This program explored a potentially lower-cost processing route for producing such panels. The alternative process sought to apply concurrent superplastic forming and adhesive bonding of aluminum alloy sheets. Processing conditions were chosen to balance adequate superplasticity of the alloy with thermal stability of the adhesive. As a first objective, an air-quenchable, superplastic aluminum-lithium alloy and a low-volatile content, low-viscosity adhesive with compatible forming/curing cycles were identified. A four-sheet forming pack was assembled which consisted of a welded two-sheet core separated from the face sheets by a layer of adhesive. Despite some preliminary success, of over 30 forming trials none was completely successful. The main problem was inadequate superplasticity in the heat-affected zones of the rib welds, which generally fractured prior to completion of the forming cycle. The welds are a necessary component in producing internal ribs by the 'four-sheet' process. Other challenges, such as surface preparation and adhesive bonding, were adequately solved. But without the larger issue of tearing at the weld locations, complex panel fabrication by SPF/AB does not appear viable.
Author
Aluminum-Lithium Alloys; Aluminum; Superplastic Forming; Adhesive Bonding; Superplasticity; Fabrication; Metal Sheets

20030057129 Defence Science and Technology Organisation, Fishermans Bend, Australia
A Review of Australian and New Zealand Investigations on Aeronautical Fatigue During the Period April 2001 to March 2003
Clark, Graham; April 2003; 74 pp.; In English; 28th Conference of the International Committee on Aeronautical Fatigue, 5-6 May 2003, Lucerne, Switzerland; Original contains color and black and white illustrations
Report No.(s): DSTO-TN-0489; DODA-AR-012-725; Copyright; Avail: Other Sources

This document has been prepared for presentation to the 28th Conference of the International Committee on Aeronautical Fatigue scheduled to be held in Lucerne Switzerland, 5th and 6th May 2003. Brief summaries and references are provided on the aircraft fatigue research and associated activities of research laboratories, universities, and aerospace companies in Australia and New Zealand during the period April 2001 to March 2003. The review covers fatigue-related research programs as well as fatigue investigations on specific military and civil aircraft.
Author
Fatigue (Materials); Aerospace Industry; Monitors; Aircraft Structures; Durability

20030057154 Swedish Defence Research Establishment, Tumba
Dynamic Hardness Testing using a Split Hopkinson Pressure Bar Apparatus
Nilsson, M.; March 2002; 42 pp.; In English
Report No.(s): PB2003-103250; FOI-R-0447-SE; No Copyright; Avail: CASI; A03, Hardcopy

To provide high strain and high strain rate data for new materials it is necessary to develop new and better testing methods. Indentation offers an attractive method because of ease of use, low costs, low material consumption and simple manufacturing of samples. The goal of this work has been to develop a dynamic, hardness-testing device using elastic waves for loading and elastic wave theory for measurement. The materials testing are 7075-T6 aluminum, SIS 2541-03 steel and SiA1ON. The set-up is similar to a traditional Hopkinson Pressure Bar. A projectile is propelled on to the transmitter bar ban by an air gun. The force acting on the indenter diamond and the indentation depth is calculated using the two strain method for non-uniform bars. The experiments show that it is possible to measure hardness of metals and ceramics and fracture toughness of ceramics at higher strain rates with the apparatus. However, no definite conclusions can be made concerning the hardness of the materials

tested. The number of samples is too small and the method had to be further evaluated.
NTIS
Dynamic Tests; Hardness Tests; Test Equipment

20030057230 Lawrence Livermore National Lab., Livermore, CA
Thermodynamical Properties of (56)Fe
Tavukcu, E.; Becker, J. A.; Bernstein, L. A.; Garrett, P. E.; Guttormsen, M.; August 30, 2002; 14 pp.; In English
Report No.(s): DE2003-15002521; UCRL-JC-143032; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Thermodynamic Properties; Iron

20030057232 Lawrence Livermore National Lab., Livermore, CA
Cleaning of Aluminum Frame Assembly Units
Shen, T. H.; May 16, 2001; 42 pp.; In English
Report No.(s): DE2003-15002767; UCRL-ID-143931; No Copyright; Avail: Department of Energy Information Bridge
The Brulin immersion and the precision cleaning experiments have shown that neither the Brulin solution nor the precision cleaning in AstroPak causes the smut formation on aluminum surfaces. The acid-bath cleaning in GTC is the primary source of the smut formation. The current GTC acid formulation etches the aluminum matrix quite aggressively, but does not appear to appreciably attack the Si particles. Therefore, this acid-bath cleaning will leave the cast aluminum part surfaces with many protruded Si particles, which could potentially cause smut problems in the cleaning process down-stream. To ensure the removal of all loose Si particles from the cast-aluminum parts, it is necessary to physically hand-wipe and vigorously wash the acid-bath cleaned surfaces. Furthermore, the casting porosity in alloy A356 could be another source in causing high swipe readings in the FAU parts.
NTIS
Cleaning; Aluminum Alloys; Residues; Solutions

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

20030057189 Lawrence Livermore National Lab., Livermore, CA
Mechanism of Ultrafine Grain Formation During Intense Plastic Straining in an Aluminum Alloy at Intermediate Temperatures
Kaibyshev, R.; Sitdikov, O.; Mazurina, I.; Lesuer, D. R.; Sep. 21, 2000; 12 pp.; In English
Report No.(s): DE2003-791066; UCRL-JC-140541; No Copyright; Avail: Department of Energy Information Bridge
The mechanism of grain formation during equal channel angular extrusion (ECAE) in a 2219 Al alloy has been studied at intermediate and high temperatures. It was shown that continuous dynamic recrystallization (CDRX) occurred during intense plastic straining and resulted in the formation of submicrometer grains at temperatures ranging from 250 degrees C to 300 degrees C. Higher temperatures (greater than 300 degrees C) hindered CDRX. This is caused by the fact that nucleation controls CDRX in the aluminum alloy. Dislocation rearrangements result in the formation of low angle boundary networks at moderate strain. The density of lattice dislocations determines the rate of subgrain formation. In addition, at lower temperatures a low energy dislocation structure (LEDS) forms concurrently with the subgrain structure and stabilizes it. The stability of the subgrain structure is very important for the resulting conversion of low angle boundaries into high angle ones with strain by extensive accumulation of mobile lattice dislocations. Increasing temperature in the range of intermediate temperatures suppresses LEDS formation and decreases the lattice dislocation density. This reduces the rate of the subgrain formation process and CDRX. As a result, at T=400 degrees C no recrystallized grains were found. At T=475 degrees C, the new grains form due to geometric dynamic recrystallization (GRX).
NTIS
Grain Boundaries; Aluminum Alloys; Plastic Deformation

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

20030056585 NASA Glenn Research Center, Cleveland, OH, USA
Low Emissions RQL Flametube Combustor Component Test Results
Holdeman, James D.; Chang, Clarence T.; January 2001; 35 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WU 714-01-4A
Report No.(s): NASA/TM-2001-210678; E-12605; NAS 1.15:210678; No Copyright; Avail: CASI; A03, Hardcopy

This report describes and summarizes elements of the High Speed Research (HSR) Low Emissions Rich burn/Quick mix/Lean burn (RQL) flame tube combustor test program. This test program was performed at NASA Glenn Research Center circa 1992. The overall objective of this test program was to demonstrate and evaluate the capability of the RQL combustor concept for High Speed Civil Transport (HSCT) applications with the goal of achieving NOx emission index levels of 5 g/kg-fuel at representative HSCT supersonic cruise conditions. The specific objectives of the tests reported herein were to investigate component performance of the RQL combustor concept for use in the evolution of ultra-low NOx combustor design tools. Test results indicated that the RQL combustor emissions and performance at simulated supersonic cruise conditions were predominantly sensitive to the quick mixer subcomponent performance and not sensitive to fuel injector performance. Test results also indicated the mixing section configuration employing a single row of circular holes was the lowest NOx mixer tested probably due to the initial fast mixing characteristics of this mixing section. However, other quick mix orifice configurations such as the slanted slot mixer produced substantially lower levels of carbon monoxide emissions most likely due to the enhanced circumferential dispersion of the air addition. Test results also suggested that an optimum momentum-flux ratio exists for a given quick mix configuration. This would cause undesirable jet under- or over-penetration for test conditions with momentum-flux ratios below or above the optimum value. Tests conducted to assess the effect of quick mix flow area indicated that reduction in the quick mix flow area produced lower NOx emissions at reduced residence time, but this had no effect on NOx emissions measured at similar residence time for the configurations tested.
Author
Flames; Combustion Chambers; Nitrogen Oxides; Exhaust Emission

20030057130 Defence Science and Technology Organisation, Edinburgh, Australia
Formulation and Performance Studies of Polymer Bonded Explosives (PBX) Containing Energetic Binder Systems, Part 1
Provatas, Arthur; March 2003; 32 pp.; In English
Report No.(s): DSTO-TR-1397; DODA-AR-012-585; Copyright; Avail: Other Sources

In an effort to comply with Insensitive Munitions (IM) criteria together with the expectation of increasing the warhead performance against specified targets, two part energetic binder systems comprising an energetic polymer and plasticiser that offer promise for future use in PBX (polymer bonded explosive) fills in high performance, tactical missiles have been investigated. Warhead fills within modern missiles such as ASRAAM (Advanced Short Range Air-to-Air Missiles) typically contain cast-cured PBXs comprising high energetics loadings in an inert binder matrix. The use of the inert binder, which comprises around 20\% of the final formulation, dilutes the final energy output of the PBX. To this end, several energetic binder formulations have been developed that may offer potential use in ASRAAM type missiles. By use of energetic binders systems comprising polyGLYN and K10 or GLYN oligomer plasticiser, increases in performance parameters were observed. This technical report details the formulation of several PBXs developed to maximize casting density and processibility for potential use in ASRAAM warheads that may offer improved IM properties.
Author
Polymers; Explosives; Detonation; Formulations; Binders (Materials); Plasticizers; Incendiary Ammunition

20030057160 Lawrence Livermore National Lab., Livermore, CA
Unexploded Ordnance Detection Using Imaging Giant Magnetoresistive (GMR) Sensor Arrays
Chaiken, A.; May 06, 1997; 18 pp.; In English
Report No.(s): DE2003-16377; UCRL-JC-127526; No Copyright; Avail: Department of Energy Information Bridge

False positive detections account for a great part of the expense associated with unexploded ordnance (UXO) remediation. Presently fielded systems like pulsed electromagnetic induction systems and cesium-vapor magnetometers are able to

distinguish between UXO and other metallic ground clutter only with difficulty. The discovery of giant magnetoresistance (GMR) has led to the development of a new generation of integrated-circuit magnetic sensors that are far more sensitive than previously available room-temperature-operation electronic devices. The small size of GMR sensors makes possible the construction of array detectors that can be used to image the flux emanating from a ferrous object or from a non-ferrous object with eddy currents imposed by an external coil. The purpose of a GMR-based imaging detector would be to allow the operator to easily distinguish between UXO and benign objects (like shrapnel or spent bullets) that litter formerly used defense sites (FUDS). In order to demonstrate the potential of a GMR-based imaging technology, a crude magnetic imaging system has been constructed using commercially available sensors. The ability to roughly determine the outline and disposition of magnetic objects has been demonstrated. Improvements to the system which are necessary to make it into a high-performance UXO detector are outlined.
NTIS
Magnetoresistivity; Explosives; Integrated Circuits; Remote Sensors

20030057182 Lawrence Livermore National Lab., Livermore, CA
Hard Target Penetrator Explosive Development Optimization of Fragment, Blast and Survivability Properties of Explosives for Hard Target Applications
Simpson, R. L.; Swansiger, R. W.; Hoffman, D. M.; James, E.; Souers, P. C.; May 1997; 30 pp.; In English
Report No.(s): DE2003-16386; UCRL-JC-126880; No Copyright; Avail: Department of Energy Information Bridge
Several new explosives have been developed for hard target and related applications. Materials having energy densities as high as 20 KJ/cc have been made. Mid-scale field trials have been carried out at Eglin Air Force Base. Fragmentation improvements 150\% that of Tritonal have been attained.
NTIS
Explosives; Weapons

20030057229 Synthetic Fuels Service, Inc., Mountain View, CA, USA
Hydrogen Supply: Cost Estimate for Hydrogen Pathways: Scoping Analysis
Simbeck, D.; Chang, E.; Nov. 2002; In English
Report No.(s): DE2003-15002482; No Copyright; Avail: National Technical Information Service (NTIS)
The International Hydrogen Infrastructure Group (IHIG) requested a comparative 'scoping' economic analysis of 19 pathways for producing, handling, distributing, and dispensing hydrogen for fuel cell (FC) vehicle applications. The 19 pathways shown were designated for large-scale central plants and the remaining four pathways focus on smaller modular units suitable for forecourt (fueling station) on-site production. Production capacity is the major determinant for some pathways. The central hydrogen conversion plant is sized to supply regional hydrogen markets, whereas the forecourt capacity is sized to meet local service station demand.
NTIS
Cost Estimates; Hydrogen; Hydrogen Fuels; Dispensers

20030057237 Lawrence Livermore National Lab., Livermore, CA
Size Effect and Detonation Front Curvature
Souers, P. C.; Jul. 1997; 10 pp.; In English
Report No.(s): DE2003-16401; No Copyright; Avail: Department of Energy Information Bridge
Heat flow in a cylinder with internal heating is used as a basis for deriving a simple theory of detonation front curvature, leading to the prediction of quadratic curve shapes. A thermal conductivity of 50 MW/mm(sup 2) is found for TATB samples.
NTIS
Detonation Waves; Curvature; Explosives

20030057239 Lawrence Livermore National Lab., Livermore, CA
Aerogel Derived Catalysts
Reynolds, J. G.; Hair, L. M.; Coronado, P. R.; Droege, M. W.; Wong, J.; Dec. 11, 1996; 16 pp.; In English
Report No.(s): DE2003-16399; UCRL-JC-125697; No Copyright; Avail: Department of Energy Information Bridge
Aerogels area class of colloidal materials which have high surface areas and abundant mesoporous structure. SiO2 aerogels show unique physical, optical and structural properties. When catalytic metals are incorporated in the aerogel framework the potential exists for new and very effective catalysts for industrial processes. Three applications of these metal

containing SiO2 aerogels as catalysts are briefly reviewed in this paper - NO(x) reduction, volatile organic compound destruction, and partial oxidation of methane.
NTIS
Silicon Dioxide; Aerogels; Volatile Organic Compounds; Colloids

20030057263 Swedish Defence Research Establishment, Tumba
Projectile Retardation with ERA (Explosive reactive Armour)
Wijk, G.; May 2002; 26 pp.; In English
Report No.(s): PB2003-103251; FOI-R-0481-SE; No Copyright; Avail: CASI; A03, Hardcopy

The disturbing effect on Shaped Charge jets and Kinetic Energy projectiles, caused by rapidly moving plates that intercept the projectiles before they reach the main target, is modeled. The intention is to obtain and model which describes the process in reasonable detail and is still sufficiently simple to be incorporated as a small but important part of a large computer program for evaluation of effects and vulnerability for complex targets. The impacts against the moving plates normally occur with significant yaw, which requires modification of previously proposed perforation models. For KE projectiles the plate interaction yields subsequent motion such that the impact against a target behind the plate also occurs with significant yaw. If the target is 'thin,' then it may be treated in the same manner as the previously impacted plate, but for 'thick' targets a new model remains to be suggested.
NTIS
Projectiles; Explosives; Applications Programs (Computers); Mathematical Models

29
SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy*.

20030056609 Clarkson Univ., Potsdam, NY, USA
Microgravity Effects on Materials Processing: A Review, Appendix D
Wilcox, William R.; Regel, Liya L.; April 2003; 9 pp.; In English; EUROMAT 2001, 10-14 Jul. 2001, Milano, Italy
Contract(s)/Grant(s): NAG5-1482; NAG8-1266; NAG8-1703; No Copyright; Avail: CASI; A02, Hardcopy

Materials processing in space has been studied both theoretically and experimentally for over 1/4 of a century. In the beginning, we naively spoke of zero gravity, elimination of convection, growth of perfect crystals, and eventual manufacturing in space. All of these appear to have fallen by the wayside. On the other hand, we have learned an unprecedented amount about the influences of gravity on materials processing. We have had many surprises, and not all experimental results have yet been satisfactorily explained. Gravity was found to influence processes that were thought to be gravity-independent. One consequence is that materials processing on earth has often been improved. And it is difficult to imagine how the materials-processing industries could have flourished without the engineers and scientists who received their training by working on microgravity materials processing.
Author
Microgravity; Microgravity Applications; Space Processing; Space Manufacturing

31
ENGINEERING (GENERAL)

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

20030057170 Lawrence Livermore National Lab., Livermore, CA
Use of In-Process EDM Truing to Generate Complex Contours on Metal-Bond, Superabrasive Grinding Wheels for Precision Grinding Structural Ceramics
Piscotty, M. A.; Davis, P. J.; Saito, T. T.; Blaedel, K. L.; Griffith, L.; Aug. 1997; 14 pp.; In English
Report No.(s): DE2003-16384; UCRL-JC-128064; No Copyright; Avail: Department of Energy Information Bridge

This paper presents recent work performed at Lawrence Livermore National Laboratory to develop cost-effective,

versatile and robust manufacturing methods for grinding precision features in structural ceramics using metal-bond, superabrasive grinding wheels. The developed processes include utilizing specialized, on-machine hardware to generate precision profiles onto grinding wheels using electrical-discharge machining (EDM) and a contoured rotating electrode.
NTIS
Ceramics; Contours; Grinding Machines; Metal-Metal Bonding; Electric Discharges; Abrasives

32
COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and *17 Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see *03 Air Transportation and Safety*; and *16 Space Transportation and Safety*.

20030057153 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Implementation of a Tracking Filter
Worth, Daniel B.; [2002]; 1 pp.; In English; 2002 Meeting of the AIAA Working Group on Dynamic Space Simulation, 23-27 Sep. 2002, Toulouse, France; No Copyright; Avail: Other Sources; Abstract Only

For Goddard's new Matlab-based data analysis system, a Hilbert transform is used to generate a quadrature signal directly from the COLA signal. This differs from the usual practice of synthesizing the sine and cosine components after determining the sweep characteristics from the COLA signal. The original and quadrature signals are in turn mixed with the signal to be analyzed and then filtered to determine the frequency spectrum. This new technique appears to be more accurate in determining frequency and is insensitive to variations in COLA amplitude.
Author
Tracking Filters; Data Processing; Hilbert Transformation; Quadratures; Signal Analysis

20030057264 National Defence Research Establishment, Linkoeping, Sweden
An Analysis of the Computer Network Operations Area
Hallberg, J.; Hunstad, A.; Eriksson, E. A.; Palmgren, S.; Jan. 2002; 36 pp.; In Swedish
Report No.(s): PB2003-103254; FOI-R-0469-SE; No Copyright; Avail: CASI; A03, Hardcopy

This report contains an analysis of the computer network operations area. The purpose is to deliver a basis for the Swedish Armed Forces to decide upon new research programs within the area. First, a structure of the area, consisting of five Information Technology (IT)-defense capabilities and three aspects of these capabilities was developed (four of the capabilities are included in the concept of CNO, which thus in principle equals the area of IT-defense). The structure can be used to categorize work and competence, but also to reveal the size and inter-disciplinary character of the area. Second, seven problem areas requiring research efforts were identified. Placing the problem areas in the structure reveals the size of the respective areas. Third, national research activity within the area of IT-defense was compiled. At important conclusion is that the area of IT-defense is strongly inter-disciplinary. However, at the same time, focus is required in order to be able to generate new results. Thus, the demand for research programs incorporating both width and focus is apparent. Moreover, all the seven identified problem areas have to be addressed.
NTIS
Computer Networks; Communication Networks

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

20030056590 NASA Glenn Research Center, Cleveland, OH, USA
A Fan Design That Meets the NASA Aeronautics Noise Goals
Dittmar, James; Tweedt, Daniel; Jeracki, Robert; Envia, Edmaine; Bartos, Karen; Slater, John; May 2003; 96 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 781-30-12
Report No.(s): NASA/TM-2003-212322; E-13915; NAS 1.15:212322; Copyright; Avail: CASI; A05, Hardcopy

A fan concept was previously identified that would meet the NASA aeronautics goal of a 20 EPNdB reduction in aircraft noise. This was a 2-stage fan with a pressure ratio of 1.15 and a 460 ft/sec tip speed. The 2 stages were identical so that, with the proper synchrophasing, noise from one stage could be used to cancel noise from the other stage. This paper documents the aerodynamic design of the 2-stage fan concept in a 22-in. diameter size for testing in the NASA Glenn 9- by 15-ft wind tunnel. A set of rotor and stator coordinates are listed in the report. Stress and flutter analyses were done on these blades and showed that the design was structurally viable. A noise prediction code, using the blade coordinates and fan flows, indicated that the 2-stage fan would meet the goal of a 20 dB reduction in fan noise.
Author
Design Analysis; Fan Blades; Noise Prediction; Noise Reduction; Stress Analysis; Aerodynamic Noise

20030056604 Dartmouth Coll., Hanover, NH, USA
Rocket Auroral Correlator Experiment
LaBelle, James; June 06, 2003; 3 pp.; In English
Contract(s)/Grant(s): NAG5-5239; No Copyright; Avail: CASI; A01, Hardcopy

Dartmouth College provided a multi-channel high- and low- frequency wave receivers, including active sensors on deployable booms, to the Rocket Auroral Correlator Experiment launched from Poker Flat, Alaska, in January 2002. College also performed preliminary analysis of the data. Details are outlined in chronological order.
Author
Design Analysis; Antenna Design; Preamplifiers; High Frequencies

20030056642 NASA Glenn Research Center, Cleveland, OH, USA
An Integrated Magnetic Circuit Model and Finite Element Model Approach to Magnetic Bearing Design
Provenza, Andrew J.; Kenny, Andrew; Palazzolo, Alan B.; April 2003; 6 pp.; In English; 37th Intersociety Energy Conversion Engineering Conference, 28 Jul. - 2 Aug. 2002, Washington, DC, USA
Contract(s)/Grant(s): WBS 22-757-01-12
Report No.(s): NASA/TM-2003-212297; E-13859; NAS 1.15:212297; ICECE-2002-20095; Copyright; Avail: CASI; A02, Hardcopy

A code for designing magnetic bearings is described. The code generates curves from magnetic circuit equations relating important bearing performance parameters. Bearing parameters selected from the curves by a designer to meet the requirements of a particular application are input directly by the code into a three-dimensional finite element analysis preprocessor. This means that a three-dimensional computer model of the bearing being developed is immediately available for viewing. The finite element model solution can be used to show areas of magnetic saturation and make more accurate predictions of the bearing load capacity, current stiffness, position stiffness, and inductance than the magnetic circuit equations did at the start of the design process. In summary, the code combines one-dimensional and three-dimensional modeling methods for designing magnetic bearings.
Author
Computer Programs; Magnetic Bearings; Finite Element Method; Mathematical Models; Magnetic Circuits; Computer Aided Design

20030056664 NASA Ames Research Center, Moffett Field, CA, USA
Evolutionary Fault Recovery in a Virtex FPGA Using a Representation That Incorporates Routing
Lohn, Jason; Larchev, Greg; DeMara, Ronald; [2003]; 8 pp.; In English; 2003 Reconfigurable Architectures Workshop, 2003; Copyright; Avail: Other Sources

Most evolutionary approaches to fault recovery in FPGAs focus on evolving alternative logic configurations as opposed to evolving the intra-cell routing. Since the majority of transistors in a typical FPGA are dedicated to interconnect, nearly 80\% according to one estimate, evolutionary fault-recovery systems should benefit by accommodating routing. In this paper, we propose an evolutionary fault-recovery system employing a genetic representation that takes into account both logic and routing configurations. Experiments were run using a software model of the Xilinx Virtex FPGA. We report that using four Virtex combinational logic blocks, we were able to evolve a 100\% accurate quadrature decoder finite state machine in the presence of a stuck-at-zero fault.
Author
Field-Programmable Gate Arrays; Transistors; Systems Health Monitoring; Fault Detection; Evolvable Hardware; Self Repairing Devices

20030057207 National Oceanic and Atmospheric Administration, Washington, DC, USA
Tennessee Valley Authority Aeromagnetics Flight-Line Data (on CD-ROM)
Mar. 2001; In English
Report No.(s): PB2003-500040; No Copyright; Avail: National Technical Information Service (NTIS)

This data contains a three year effort to track down, assimilate and quality control aeromagnetics data of the Tennessee Valley flown from 1972 - 1978. Territory covered by the data are all of Kentucky, most of Tennessee, Southern Illinois, Southern Indiana, a portion of Southeastern Missouri, and a small portion of Northern Mississippi, Northwestern Alabama, and western Virginia.

NTIS
Geology; Gravitation; Data Processing

20030057210 Lawrence Livermore National Lab., Livermore, CA
Measured and Theoretical Characterization of the RF Properties of Stacked, High-Gradient Insulator Material
Caporaso, G. J.; Shang, C. C.; Sampayan, S. E.; Molau, N. E.; Krogh, M. L.; May 09, 1997; 10 pp.; In English
Report No.(s): DE2003-16382; UCRL-JC-125791; No Copyright; Avail: Department of Energy Information Bridge

Recent high-voltage breakdown experiments of periodic metallic-dielectric insulating structures have suggested several interesting high-gradient applications. One such area is the employment of high-gradient insulators in high-current, electron-beam, accelerating induction modules. For this application, the understanding of the rf characteristics of the insulator plays an important role in estimating beam-cavity interactions. In this paper, we examine the rf properties of the insulator comparing simulation results with experiment. Different insulator designs are examined to determine their rf transmission properties in gap geometries.

NTIS
Accelerators; Electrical Insulation

20030057223 National Defence Research Establishment, Linkoeping, Sweden
Description of the 'IR/mm-wave' Data Acquisition System: The PRF-Generator
Lindstroem, S.; Mar. 2002; 44 pp.; In Swedish
Report No.(s): PB2003-103185; FOI-R-0433-SE; No Copyright; Avail: CASI; A03, Hardcopy

This report describes the special trigger generator (PRF-generating), one of the components in the measuring experimental systems that is under development in the 'IR/mm project.' The document also describes the connections to other modules in the measuring experimental system.

NTIS
Data Acquisition; Infrared Radiation; Millimeter Waves; Actuators; Electric Generators

20030057224 National Defence Research Establishment, Linkoeping, Sweden
Design of Experiment: How to Improve Reverberation Chamber Mode-Stirrer Efficiency
Lunden, O.; Baeckstroem, M.; Apr. 2002; In English
Report No.(s): PB2003-103186; FOI-R-0468-SE; No Copyright; Avail: National Technical Information Service (NTIS)

What makes a Mode Stirrer efficient in a reverberation chamber, and how can one find the parameters of major importance. This is a problem that might be very complicated to analyze theoretically or to model. An alternative interesting approach, that can be performed quite easily, is to carry out a Design of Experiment (DOE). The focus has been to investigate traditional rotational mode-stirrers. To perform a general factorial design, an investigator selects a fixed number of 'levels' (or 'versions') for each of a number of variables (factors) and then runs the experiments with all possible combinations. The test criterion selected in this case study has been the specific lowest frequency for each stirrer chamber combination, which corresponds to at least 200 uncorrelated stirrer positions. The outcome of the factorial design experiment shows that the effect of changing the diameter of the stirrer is much greater than changing the height. This seems to be more pronounced at 50 uncorrelated stirrer steps than at 200. The effect of changing the chamber volume is rather small. The latter is illustrated by the fact that the lowest frequency for 200 uncorrelated stirrer steps improves about 60\% if it is used in the small 1 cu.mi. chamber compared to the 210 cu.mi.

NTIS
Experiment Design; Reverberation Chambers; Stirring; Rotation

20030057227 National Defence Research Establishment, Linkoeping, Sweden
Microwave Field-to-Printed-Circuit-Board Coupling Measurements in Reverberation Chamber
Silfverskioeld, S.; Baeckstroem, M.; Loren, J.; Feb. 2002; 64 pp.; In English
Report No.(s): PB2003-103188; FOI-R-0425-SE; No Copyright; Avail: CASI; A04, Hardcopy

We have recently reported an experimental study of microwave, 0.5 to 18 GHz, field-to-wire coupling for some basic wire geometries above a ground plane performed in Anechoic (AC) and Reverberation Chambers (RC). Receiving parameters and comparisons between measurements in the two chambers were presented. We showed e.g. that the antenna receiving cross section sigma(sub w) of wires measured in the RC follows a sigma(sub w)-distribution with two degrees of freedom. In this report we study the field-to-printed-circuit-board coupling for some single-sided, double-sided, and multi-layer printed-circuit-boards (PCBs) performed in RC. We present receiving parameters including the realized gain G(sub R), the impedance mismatch factor 1, the input resistance R(sub in), the receiving cross section sigma(sub w) and the effective antenna length h(sub e). We show that sigma(sub w) of traces on PCBs also follows a x(sup 2)-distribution with two degrees of freedom. The effective antenna length h(sub e) of traces on PCBs is found to be bounded by the wave length Lambda. The impedance matched receiving cross section is bounded by Lambda(sup 2)/8 pi.
NTIS
Anechoic Chambers; Microwaves; Reverberation Chambers; Coupling; Printed Circuits; Circuit Boards

20030057252 National Defence Research Establishment, Linkoeping, Sweden
Development of Background Modelling
Zdansky, E.; Fagerstroem, J.; Gustaffsson, M.; Nilsson, S.; Rahm, J.; Dec. 2001; 22 pp.; In Swedish
Report No.(s): PB2003-103182; FOI-R-0187-SE; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this interim report is to give an account of the progress in the development of models for the interaction between a target object and the surrounding terrain. The radar cross section at 10 GHz has been studied for the simple type case of a rectangular plate leaning with variable inclination on a rough ground surface. The interaction has been modeled in two different ways. The first method estimates the mean interaction. The second approach is to do coherent calculations for a model generated with a stochastically faceted ground surface. The two methods are compared for three different inclinations. These methods, as well as the intermediate level incoherent modeling with stochastic variations are discussed. Requirements on software for coherent calculations on stochastic models are suggested, and conclusions on limitations in the applicable angular range are given. Further conclusions can only be drawn after measurements in a later stage of this project.
NTIS
Radar Cross Sections; Mathematical Models; Target Recognition

20030057277 Sandia National Labs., Albuquerque, NM
Characterization of a Track-and-Hold Amplifier for Application to a High Performance SAR
Dubbert, D. F.; Hardin, T. L.; Delaplain, G. G.; Jul. 2000; In English
Report No.(s): DE2003-801387; SAND2002-2127; No Copyright; Avail: National Technical Information Service (NTIS)

A Synthetic Aperture Radar (SAR) which employs direct IF sampling can significantly reduce the complexity of the analog electronics prior to the analog-to-digital converter (ADC). For relatively high frequency IF bands, a wide-bandwidth track-and-hold amplifier (THA) is required prior to the ADC. The THA functions primarily as a means of converting, through bandpass sampling, the IF signal to a baseband signal which can be sampled by the ADC. For a wide-band, high dynamic-range receiver system, such as a SAR receiver, stringent performance requirements are placed on the THA. We first measure the THA parameters such as gain, gain compression, third-order intercept (TOI), signal-to-noise ratio (SNR), spurious-free dynamic-range (SFDR), noise figure (NF), and phase noise. The results are then analyzed in terms of their respective impact on the overall performance of the SAR. The specific THA under consideration is the Rockwell Scientific RTH010.
NTIS
Amplifiers; Analog To Digital Converters

20030057286 Argonne National Lab., IL, USA, Hewlett-Packard Co., Palo Alto, CA, USA
Statistical On-Chip Interconnect Modeling: An Application of Automatic Differentiation
Bischof, C.; Roh, L.; Chang, N.; Lee, K.; Kanaevsky, V.; 2000; 16 pp.; In English
Report No.(s): DE2003-775251; ANL/MCS-P698-1097; No Copyright; Avail: Department of Energy Information Bridge

Automatic differentiation is a technique for computing derivatives accurately and efficiently with minimal human effort.

We employed this technique to generate derivative information of FCAP2 (2-D) and FCAP3 (3-D) programs that simulate the parasitic effects of interconnects and devices. This derivative information is used in the statistical modeling of worst-case interconnect delays and on-chip crosstalks. The ADIC (Automatic Differentiation in C) tool generated new versions of FCAP2 and FCAP3 programs that compute both the original results and the derivative information. Given the ANSI C source code for the function, ADIC generates new code that computes derivatives of the model output with respect to the input parameters. We report on the use of automatic differentiation and divided difference approaches for computing derivatives for FCAP3 programs. The results show that ADIC-generated code computes derivatives more accurately, more robustly, and faster than the divided difference approach.
NTIS
Automation; Chips (Electronics); Circuits

20030057288 Lawrence Livermore National Lab., Livermore, CA
Semiconductor Quantum Dots for Advanced Blue Light Emitting Devices and Laser Diodes
Lee, H.; Thielen, P.; Apr. 20, 2000; In English
Report No.(s): DE2003-792654; UCRL-ID-138550; No Copyright; Avail: National Technical Information Service (NTIS)

Blue light emitting devices (LEDs) are rapidly becoming an increasingly important technology underscored by intense world-wide research and development. Blue emitter technology is the cornerstone for crucial applications that include full-color flat panel displays, ultra-high density optical memories and data storage, back lighting, and chemical and biological sensing. Currently, the GaN material system dominate the field of blue emitters, which in turn is dominated by Japanese researchers. However, critical obstacles remain for this material system. Growth-related defects, which arise from lattice-matching problems, degrade the device and limits operational lifetimes. Blue GaN diodes produced in Japan presently operate for the longest time. Those produced in the US have significantly shorter lifetimes.
NTIS
Semiconductors (Materials); Service Life; Gallium Nitrides; Diodes; Semiconductor Devices

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

20030055617 NASA Marshall Space Flight Center, Huntsville, AL, USA
General Equation Set Solver for Compressible and Incompressible Turbomachinery Flows
Sondak, Douglas L.; Dorney, Daniel J.; [2002]; 20 pp.; In English; NASA MSFC Fluids Workshop, 19-21 Nov. 2002, Huntsville, AL, USA; Original contains black and white illustrations; Copyright; Avail: Other Sources

This viewgraph presentation provides information on the development of a turbomachinery flow solver. The presentation profiles Corsair, the rotor code which was a motivation for the development of the solver. Corsair's limitations are discussed, and the presentation introduces a general equation set with pseudocompressibility. Equations for general flow regimes and general fluid properties are presented, and diagrams of results are included.
CASI
Fluid Dynamics; Turbomachinery; Compressible Flow; Incompressible Flow

20030055619 NASA Ames Research Center, Moffett Field, CA, USA
Compressed Semi-Discrete Central-Upwind Schemes for Hamilton-Jacobi Equations
Bryson, Steve; Kurganov, Alexander; Levy, Doron; Petrova, Guergana; [2003]; 23 pp.; In English
Contract(s)/Grant(s): NSF DMS-01-96439; NSF DMS-01-33511; NSF DMS-02-96020; RTOP 704-40-42; Copyright; Avail: CASI; A03, Hardcopy

We introduce a new family of Godunov-type semi-discrete central schemes for multidimensional Hamilton-Jacobi equations. These schemes are a less dissipative generalization of the central-upwind schemes that have been recently proposed in series of works. We provide the details of the new family of methods in one, two, and three space dimensions, and then verify their expected low-dissipative property in a variety of examples.
Author
Upwind Schemes (Mathematics); Computational Fluid Dynamics; Hamilton-Jacobi Equation; Equations Of Motion; Godunov Method; Dissipation; Unstructured Grids (Mathematics)

20030055676 NASA Langley Research Center, Hampton, VA, USA

Electromagnetic Scattering From a Polygonal Thin Metallic Plate Using Quadrilateral Meshing

Deshpande, Manohar D.; May 2003; 40 pp.; In English

Contract(s)/Grant(s): RTOP 706-31-41-01

Report No.(s): NASA/TM-2003-212165; NAS 1.15:212165; L-18272; No Copyright; Avail: CASI; A03, Hardcopy

The problem of electromagnetic (EM) scattering from irregularly shaped, thin, metallic flat plates in free space is solved using the electric field integral equation (EFIE) approach in conjunction with the method of moments (MoM) with quadrilateral meshing. An irregularly shaped thin plate is discretized into quadrilateral patches and the unknown electric surface current over the plate is expressed in terms of proper basis functions over these patches. The basis functions for the electric surface current density that satisfy the proper boundary conditions on these quadrilateral patches are derived. The unknown surface current density on these quadrilateral patches is determined by setting up and solving the electric field integral equation by the application of the MoM. From the knowledge of the surface current density, the EM scattering from various irregularly shaped plates is determined and compared with the earlier published results. The novelty in the present approach is the use of quadrilateral patches instead of well known and often used triangular patches. The numerical results obtained using the quadrilateral patches compare favorably with measured results.

Author

Electromagnetic Scattering; Method Of Moments; Flat Plates; Computational Grids; Electric Current; Current Density; Surface Properties; Integral Equations

20030055679 NASA Langley Research Center, Hampton, VA, USA

Effect of Turbulence Models on Two Massively-Separated Benchmark Flow Cases

Rumsey, Christopher L.; May 2003; 50 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): RTOP 762-20-11-06

Report No.(s): NASA/TM-2003-212412; NAS 1.15:212412; L-18284; No Copyright; Avail: CASI; A03, Hardcopy

Two massively-separated flow cases (the 2-D hill and the 3-D Ahmed body) were computed with several different turbulence models in the Reynolds-averaged Navier-Stokes code CFL3D as part of participation in a turbulence modeling workshop held in Poitiers, France in October, 2002. Overall, results were disappointing, but were consistent with results from other RANS codes and other turbulence models at the workshop. For the 2-D hill case, those turbulence models that predicted separation location accurately ended up yielding a too-long separation extent downstream. The one model that predicted a shorter separation extent in better agreement with LES data did so only by coincidence: its prediction of earlier reattachment was due to a too-late prediction of the separation location. For the Ahmed body, two slant angles were computed, and CFD performed fairly well for one of the cases (the larger slant angle). Both turbulence models tested in this case were very similar to each other. For the smaller slant angle, CFD predicted massive separation, whereas the experiment showed reattachment about half-way down the center of the face. These test cases serve as reminders that state- of-the-art CFD is currently not a reliable predictor of massively-separated flow physics, and that further validation studies in this area would be beneficial.

Author

Computational Fluid Dynamics; Separated Flow; Turbulence Models

20030055680 NASA Langley Research Center, Hampton, VA, USA

Estimation of Complex Permittivity of Composite Multilayer Material at Microwave Frequency Using Waveguide Measurements

Deshpande, Manohar D.; Dudley, Kenneth; May 2003; 80 pp.; In English

Contract(s)/Grant(s): RTOP 706-31-41-01

Report No.(s): NASA/TM-2003-212398; L-18285; NAS 1.15:212398; No Copyright; Avail: CASI; A05, Hardcopy

A simple method is presented to estimate the complex dielectric constants of individual layers of a multilayer composite material. Using the MatLab Optimization Tools simple MatLab scripts are written to search for electric properties of individual layers so as to match the measured and calculated S-parameters. A single layer composite material formed by using materials such as Bakelite, Nomex Felt, Fiber Glass, Woven Composite B and G, Nano Material #0, Cork, Garlock, of different thicknesses are tested using the present approach. Assuming the thicknesses of samples unknown, the present approach is shown to work well in estimating the dielectric constants and the thicknesses. A number of two layer composite materials formed by various combinations of above individual materials are tested using the present approach. However, the present approach could not provide estimate values close to their true values when the thicknesses of individual layers were assumed to be unknown. This is attributed to the difficulty in modelling the presence of airgaps between the layers while doing the

measurement of S-parameters. A few examples of three layer composites are also presented.
Author
Composite Materials; Electrical Properties; Microwave Frequencies; Substrates; Dielectric Permeability; Estimating; Electric Fields

20030056586 NASA Glenn Research Center, Cleveland, OH, USA
Simulation of the Flow Field Associated With a Rocket Thruster Having an Attached Panel
Davoudzadeh, Farhad; Liu, Nan-Suey; May 2003; 36 pp.; In English; 2003 Fluids Engineering Division Summer Meeting, 6-10 Jul. 2003, Honolulu, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 22-713-10-06
Report No.(s): NASA/TM-2003-212347; E-13935; NAS 1.15:212347; Copyright; Avail: CASI; A03, Hardcopy

Two-dimensional inviscid and viscous numerical simulations are performed to predict the flow field induced by a H2-O2 rocket thruster and to provide insight into the heat load on the articles placed in the hot gas exhaust of the thruster under a variety of operating conditions, using the National Combustion Code (NCC). The simulations have captured physical details of the flow field, such as the plume formation and expansion, formation of the shock waves and their effects on the temperature and pressure distributions on the walls of the apparatus and the flat panel. Comparison between the computed results for 2-D and adiabatic walls and the related experimental measurements for 3-D and cooled walls shows that the results of the simulations are consistent with those obtained from the related rig tests.
Author
Two Dimensional Models; Inviscid Flow; Viscous Flow; Flow Distribution; Liquid Rocket Propellants; Liquid Oxygen; Liquid Hydrogen

20030056607 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Fluid Physics of Foam Evolution and Flow
Aref, H.; Thoroddsen, S. T.; Sullivan, J. M.; [2003]; 4 pp.; In English
Contract(s)/Grant(s): NAG3-2122; No Copyright; Avail: CASI; A01, Hardcopy

The grant supported theoretical, numerical and experimental work focused on the elucidation of the fluid physics of foam structure, evolution and flow. The experimental work concentrated on these subject areas: (a) Measurements of the speed of reconnections within a foam; (b) statistics of bubble rearrangements; and (c) three-dimensional reconstruction of the foam structure. On the numerical simulation and theory side our efforts concentrated on the subjects: (a) simulation techniques for 2D and 3D foams; (b) phase transition in a compressible foam; and (c) TCP structures.
Derived from text
Fluid Dynamics; Elution; Foams; Bubbles; Statistical Analysis; Three Dimensional Models

20030056634 Notre Dame Univ., IN, USA
Enhanced Design of Turbo-Jet LPT by Separation Control Using Phased Plasma Actuators
Ashpis, David, Technical Monitor; Corke, Thomas C.; Thomas, Flint O.; April 2003; 25 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-935; WU 708-87-23
Report No.(s): NASA/CR-2003-212294; E-13856; NAS 1.26:212294; No Copyright; Avail: CASI; A03, Hardcopy

This work deals with the documentation and control of flow separation that occurs over turbine blades in the low-pressure turbine stage at low Reynolds numbers that exist at high altitude cruise. We utilize a specially constructed linear cascade that is designed to study the flow field over a generic LPT cascade consisting of Pratt & Whitney 'Pak B' shaped blades. This facility was constructed under a previous one-year NASA Glenn RC initiative. The center blade in the cascade is instrumented to measure the surface pressure coefficient distribution. Optical access allows two-component LDV measurement for boundary layer profiles. Experimental conditions have been chosen to give a range of chord Reynolds numbers from 10 to 100K, and a range of free-stream turbulence levels from u'/U(sub infinity)= 0.08 to 3 percent. The surface pressure measurements were used to define a region of separation and reattachment that depend on the free-stream conditions. The location of separation was found to be relatively insensitive to the experimental conditions. However, reattachment location was very sensitive to the turbulence level and Reynolds number. Excellent agreement was found between the measured pressure distributions and predictions from Euler and RANS simulations. Two-component LDV measurements are presently underway to document the mean and fluctuating velocity components in the boundary layer over the center blade for the range of experimental conditions. The fabrication of the plasma actuator is underway. These are designed to produce either streamwise vortices, or a

downstream-directed wall jet. A precursor experiment for the former approach was performed with an array of vortex generators placed just upstream of the separation line. These led to reattachment except for the lowest Reynolds number. Progress has also been made on the proposed concept for a laterally moving wake. This involved constructing a smaller wind tunnel and molding an array of symmetric airfoils to form an array. Following its development, it will be scaled up and used to introduce lateral moving wakes upstream up the Pak-B cascade.
Author
Boundary Layer Separation; Separated Flow; Computational Fluid Dynamics; Turbine Blades; Pressure Distribution; Flow Distribution; Actuators; Reattached Flow

20030056706 Eloret Corp., Moffett Field, CA, USA
Aeromechanic Analysis of a Missile with Freely Spinning Tailfins
Nygaard, Tor A.; [2003]; 11 pp.; In English; 21st AIAA Applied Aerodynamics Conference, 23-26 Jun. 2003, Orlando, FL, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper 2003-3672; Copyright; Avail: Other Sources

The objective of the present work is to demonstrate the utility of Chimera overset grid methods for missiles with freely spinning tailfins. Computations on grids with two levels of resolution and three levels of geometric detail are used to assess grid convergence and the significance of the different geometric features of the missile. The grid convergence is good for overall force and moment vectors. The numerous protuberances on the missile have a limited influence on the overall forces. A yaw maneuver is computed on a medium resolution grid with 17 million gridpoints. The tail spins in response to the computed tail rolling moment. The asymmetric inflow to the tail results in a spin-rate of approximately 2000 revolutions per minute. The results are in excellent agreement with an unstructured grid CFD model, and in fair agreement with experimental results. Overall, the Chimera overset method seems to be well suited for geometrically complex moving body configurations. Author
Computational Fluid Dynamics; Tail Assemblies; Fins; Aerodynamic Loads; Missiles; Aerodynamics; Computational Grids; Grid Generation (Mathematics); Design Analysis; Fluid Flow

20030057198 Lawrence Livermore National Lab., Livermore, CA
Newtonian Flow in Bulk Amorphous Alloys
Wadsworth, J.; Nieh, T. G.; Sep. 27, 2000; 16 pp.; In English
Report No.(s): DE2003-791076; UCRL-JC-140606; No Copyright; Avail: Department of Energy Information Bridge

Bulk amorphous alloys have many unique properties, e.g. , superior strength and hardness, excellent corrosion resistance, reduced sliding friction and improved wear resistance, and easy formability in a viscous state. These properties, and particularly easy formability, are expected to lead to applications in the fields of near-net-shape fabrication of structural components. Whereas large tensile ductility has generally been observed in the supercooled liquid region in metallic glasses, the exact deformation mechanism, and in particular whether such alloys deform by Newtonian viscous flow, remains a controversial issue. In this paper, existing data are analyzed and an interpretation for the apparent controversy is offered. In addition, new results obtained from an amorphous alloy (composition: Zr-10Al-5TI-17.9Cu-14,6NI, in at. percent) are presented. Structural evolution during plastic deformation is particularly characterized. It is suggested that the appearance of non-Newtonian behavior is a result of the concurrent crystallization of the amorphous structure during deformation.
NTIS
Alloys; Fluid Flow; Mechanical Properties

20030057248 South Carolina Energy Research and Development Center, Clemson, SC, USA
Advanced Gas Turbine Systems Research
2002; In English
Report No.(s): DE2003-807154; No Copyright; Avail: National Technical Information Service (NTIS)

The objective of the current investigation is to help reduce the risk associated with developing new gas turbine systems with advanced low NOx combustors. The current experimental investigation, which is being conducted at the University of North Dakota, involves developing a heat transfer and film-cooling database for two cascade geometries. One geometry involves a linear cascade, which uses a fully loaded vane design and the second cascade has a strongly contracting inlet and features an aft loaded vane design. The large-scale low speed cascades used in this study have eleven to one scaling to allow well-resolved heat transfer and film cooling measurements. The current analytical investigation, which is being conducted at Rolls Royce, involves developing predictions for the heat transfer and film cooling database and using the computational

models to transfer the results to engine-like conditions. The heat transfer and film cooling data are being acquired over chord exit Reynolds numbers ranging from 500,000 to 2,000,000 using up to five different turbulence inlet conditions tested over two separate cascade geometries.
NTIS
Manufacturing; Gas Turbine Engines; Nitrogen Oxides

20030057260 Swedish Defence Research Establishment, Stockholm
Nonlocal Instability Analysis Based on the Multiple-Scales Method
Johannesson, J.; Hanifi, A.; Apr. 2002; 54 pp.; In English
Report No.(s): PB2003-103248; FOI-R-0463-SE; No Copyright; Avail: CASI; A04, Hardcopy

Multiple-scales technique (MSC) is used to examine the instability of non-parallel, compressible, quasi three-dimensional boundary layer flows. It models the kinematics and convective amplification of waves with weakly divergent or curved wave-rays and wave-fronts, propagating in a weakly non-uniform flow. The stability equations are put in a system of ordinary differential equations in a general orthogonal curvilinear coordinate system. The zeroth- order equations are homogeneous and govern the disturbance motion in a parallel flow and the non-local effects are calculated from the inhomogeneous first-order equations. The equations rewritten as a system of first order differential equations are discretized using compact finite difference scheme. For validation of the multiple-scales technique, the authors have compared the growth rates with results from 'parabolized stability equations' (PSE).
NTIS
Unsteady Flow; Boundary Layer Flow

20030057261 Swedish Defence Research Establishment, Stockholm
Approximate Solutions to Slightly Viscous Conservation Laws
Efraimsson, G.; Kreiss, G.; Feb. 2002; 40 pp.; In English
Report No.(s): PB2003-103249; FOI-R-0454-SE; No Copyright; Avail: CASI; A03, Hardcopy

The authors study approximate solutions of a slightly viscous conservation law in one dimension, constructed by two asymptotic expansions that are cut off after the third order terms. In the shock layer an inner solution is valid and an outer solution is valid elsewhere. The two solutions are matched in a matching region. Based on the stability results the authors show that for a given time interval the difference between the approximate solutions and the true solution is not larger than omicron(epsilon), where epsilon is the viscosity coefficient.
NTIS
Shock Waves; Solutions

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20030055628 Rhode Island Univ., Narragansett, RI, USA
Flame Spray Strain Gages With Improved Durability and Lifetimes
Fralick, Gustave, Technical Monitor; Gregory, Otto; April 2003; 22 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG3-2652; WU 708-87-23
Report No.(s): NASA/CR-2003-212210; E-13818; NAS 1.26:212210; No Copyright; Avail: CASI; A03, Hardcopy

The focus of this APP research program was to improve the bond coats used in the fabrication of flame sprayed instrumentation. Typically. a bond coat is applied to a superalloy surface prior to the application of a thin dielectric coating onto which instrumentation is placed. After affixing the instrumentation, a much thicker ceramic topcoat is typically applied to protect the instrumentation from harsh environments. The fatigue life of NiCoCrAlY coated superalloys was extended beyond current state-of-the-art by relatively simple and cost effective means. Heat treatment in reduced oxygen partial pressures at 1750 to 1800 F effectively doubled the fatigue life of NiCoCrAlY coated substrates relative to as-sprayed substrates and when used in conjunction with platinum diffusion barriers yielded a four fold increase in the fatigue life of NiCoCrAlY coated substrates. Further improvements in the fatigue life of thermally sprayed coatings were made by

employing intermediate coatings, which minimized thermal expansion differences between the bond coat and top coat. Combinatorial chemistry experiments yielded an optimum composition for an intermediate TCE matching coating that showed considerable promise in extending the fatigue life of thermal spray instrumentation. The intermediate coating had two functions: to reduce the surface roughness of the peaks and valleys associated with the as-sprayed NiCoCrAlY bond coat, and to produce a thin layer of a mixture of Al2O3 and NiCoCrAlY that exhibited an intermediate TCE. The optimal composition of the intermediate coating consisted of 60 wt% Al2O3 and 40 wt% NiCoCrAlY, as determined by energy dispersive analysis of x-rays (EDS). Intermediate coatings having this composition were prepared by physical vapor deposition and the resulting coating systems are being evaluated in our test facility.
Author
Strain Gages; Flame Spraying; Fabrication; Heat Resistant Alloys; Life (Durability); Heat Treatment

20030056596 Harvard Coll. Observatory, Cambridge, MA, USA
Development of EXITE3, Imaging Detectors and a Long Duration Balloon Gondola
[2003]; 13 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-5103; No Copyright; Avail: CASI; A03, Hardcopy

In this Report we summarize the work conducted for the EXITE program under grant NAG5-5103. This grant supported the ongoing EXITE program at Harvard for the development of imaging hard x-ray detectors and telescopes over the 3 year period 1997-2000 with a one year extension to 2001 to transition to the next SR&T grant in this program. Work was conducted in three major parts: analysis of the EXITE2 balloon flight data (from our May 1997 flight); development of pixellated imaging Cd-Zn-Te detector arrays and readout systems for the proposed EXITE3 detector and telescope; and development of systems for a Long Duration Balloon (LDB) gondola. Progress on all three major aspects of this research is summarized for each of the years of this grant.
Author
Gondolas; Balloon-Borne Instruments; X Ray Detectors; X Ray Imagery

20030056613 Harvard Coll. Observatory, Cambridge, MA, USA
Ultra-long Duration Balloon Mission Concept Study: EXIST-LITE Hard X-ray Imaging Survey
[2003]; 12 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-5209; No Copyright; Avail: CASI; A03, Hardcopy

We carried out a mission concept Study for an ultra-long duration balloon (ULDB) mission to conduct a high-sensitivity hard x-ray (approx. 20-600 keV) imaging sky survey. The EXIST-LITE concept has been developed, and critical detector technologies for realistic fabrication of very large area Cd-Zn-Te imaging detector arrays are now much better understood. A ULDB mission such as EXIST-LITE is now even more attractive as a testbed for the full Energetic X-ray Imaging Survey Telescope (EXIST) mission, recommended by the Decadal Survey, and now included in the NASA Roadmap and Strategic Plan as one of the 'Einstein Probes'. In this (overdue!) Final Report we provide a brief update for the science opportunities possible with a ULDB mission such as EXIST-LITE and relate these to upcoming missions (INTErnational Gamma-Ray Astrophysics Laboratory (INTEGRAL) and Swift) as well as the ultimate very high sensitivity sky survey mission EXIST. We then review the progress made over this investigation in Detector/Telescope design concept, Gondola and Mission design concept, and Data Handling/Analysis.
Author
Balloons; X Ray Imagery; X Ray Telescopes; Sky Surveys (Astronomy); X Ray Detectors

20030057157 Virginia Transportation Research Council, Charlottesville, VA
Integration of Multiband Imagery as a Means of Monitoring Wetland Resources for the Virginia Department of Transportation
Fitch, G. M.; Anderson, J. E.; Ridout, S. A.; Goodall, J. L.; Mar. 2003; 36 pp.; In English
Report No.(s): PB2003-103382; VTRC-03-CR19; Copyright; Avail: National Technical Information Service (NTIS)

Digital multispectral imagery is a data collection technique that provides digital frame coverage in four spectral bands for color infrared imaging, allowing for the detection of soils, vegetation, water bodies, chemically contaminated areas, and various other resources. It is anticipated that using multispectral digital imagery technology for wetlands data collection will aid the Virginia Department of Transportation's (VDOT) Environmental Division in meeting the increasingly stringent monitoring requirements placed on it by state and federal regulatory agencies. Previous research conducted by the Virginia Transportation Research Council and Virginia Commonwealth University concluded that multispectral imagery was

technically feasible and significantly less expensive than traditional field methods. The primary objective of this research was to aid VDOT in implementing digital multispectral imagery to acquire some of the vegetation data required for the monitoring of its wetland mitigation program by determining the accuracy of the data collected with this technology and comparing it with data collected manually in the field. This was done in the hopes of convincing VDOT and the regulatory agencies that data collected by this means could replace some of the vegetation information currently collected manually.
NTIS
Data Acquisition; Wetlands; Multispectral Band Scanners; Remote Sensing

20030057220 Fluor Daniel Hanford, Inc., Richland, WA, USA
Critical Characteristics of Radiation Detection System Components to be Dedicated for Use In Safety Class/Safety Significant System
Davis, S. J.; May 25, 2000; 14 pp.; In English
Report No.(s): DE2003-804228; No Copyright; Avail: Department of Energy Information Bridge

This document identifies critical characteristics of components to be dedicated for use in Safety Class (SC) or Safety Significant (SS) Systems, Structures, or Components (SSCs). This document identifies the requirements for the components of the common radiation area monitor alarm in the WESF pool cell. These are procured as Commercial Grade Items (CGI), with the qualification testing and formal dedication to be performed at the Waste Encapsulation Storage Facility (WESF), in safety class, safety significant systems. System modifications are to be performed in accordance with the instructions provided on ECN 658230. Components for this change are commercially available and interchangeable with the existing alarm configuration. This document focuses on the operational requirements for alarm, declaration of the safety classification, identification of critical characteristics, and interpretation of requirements for procurement. Critical characteristics are identified herein and must be verified, followed by formal dedication, prior to the components being used in safety related applications.
NTIS
Radiation Detectors; Warning Systems; Equipment Specifications; Systems Engineering; Industrial Safety

20030057253 Swedish Defence Research Establishment, Linkoeping, Sweden
Perspective Presentation in HUM with Binocular and Binocular Information
Andersson, P.; Dec. 2001; 24 pp.; In Swedish
Report No.(s): PB2003-103183; FOI-R-0318-SE; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study was to investigate if there are any differences between judging the direction in a 3D virtual environment between bi- and binocular presentations. A dynamic air scenario was used, own-shop and target symbols were presented in an exocentric inside-out perspective. The scenario was presented in a HMD (Headmounted Display), with different pictures (binocular) or same picture (binocular) to the subjects' eyes. The subjects judged azimuth and elevation direction between own-ship and one target symbol. The results showed that there was no difference in judgment between bi- and binocular presentations. However, elevation judgments were affected by the camera placement 10 degrees above and behind own-ship, where some elevation angles were more difficult to judge than others. Other studies haven't answered if, and when, binocular presentation shall be used. This study was the first in a series of experiments that intend to answer the question if, and when, binocular presentation gives perceptual advantages over binocular presentation.
NTIS
Binoculars; Night Vision; Image Intensifiers

36
LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20030057161 Lawrence Livermore National Lab., Livermore, CA
Localized CO(2) Laser Treatment for Mitigation of 3(Omega) Damage Growth in Fused Silica
Brusasco, R. M.; Penetrante, B. M.; Butler, J. A.; Hrubesh, L. W.; Dec. 07, 2002; 12 pp.; In English
Report No.(s): DE2002-15002005; No Copyright; Avail: Department of Energy Information Bridge

A technique for inhibiting the growth of laser-induced surface damage on fused silica, initiated and propagated at the 351

nm laser wavelength, has been investigated. The technique exposes the damage sites to single pulses of a CO2 laser operating at the 10.6 micrometer wavelength at or near beam focus. This method results in a very localized treatment of the laser damage site and modifies the site such that laser damage does not propagate further. A laser damage site initiated with a single pulse of 355 nm laser light at approximately 45 J per square centimeter and 7.5 ns pulse duration grows rapidly upon further illumination at 8 J per square centimeter with 100\% probability. Treatment of these sites with single pulses of 10.6 mm laser light for one second at a power level of between 17 and 37 Watts with a beam diameter of 5 mm alters the damage site such that it does not grow with subsequent 351 nm laser illumination at 8 J per square centimeter 10 ns pulse duration for greater than 1000 shots. The technique has been found to be 100\% effective at stopping the growth of the laser damage.
NTIS
Carbon Dioxide Lasers; Optical Materials; Silica Glass; Laser Damage

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20030057159 Lawrence Livermore National Lab., Livermore, CA
Computer Generated Reduced Iso-Octane Chemical Kinetic Mechanism Applied to Simulation of HCCI Combustion
Aceves, S. M.; Martineez-Frias, J.; Flowers, D.; Smith, J. R.; Dibble, R.; August 2002; 14 pp.; In English
Report No.(s): DE2002-15002003; No Copyright; Avail: Department of Energy Information Bridge
This paper shows how a computer can systematically remove non-essential chemical reactions from a large chemical kinetic mechanism. The computer removes the reactions based upon a single solution using a detailed mechanism. The resulting reduced chemical mechanism produces similar numerical predictions significantly faster than predictions that use the detailed mechanism.
NTIS
Reaction Kinetics; Octanes; Computer Programs; Computerized Simulation; Combustion

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

20030057202 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Information Technology Laboratory (ITL) Technical Accomplishments, 2002. Enabling a Better Future
Nov. 2002; 52 pp.; In English
Report No.(s): PB2003-104488; NISTIR-6909; No Copyright; Avail: CASI; A04, Hardcopy
The Information Technology Laboratory's (ITL) core purpose is to enable a better future through information technology. The mission of ITL is to develop and promote measurement, standards, and technology for information technology (IT) to enhance productivity, facilitate trade, and improve the quality of life. ITL also provides NIST with high-quality information technology services and helps federal agencies in understanding and arranging for computer security. ITL's vision is to be the global leader in measurement and enabling technology for information technology, delivering outstanding value to the nation.
NTIS
Project Management; Research Management; Information Systems

20030057238 Lockheed Martin Energy Systems, Inc., Oak Ridge, TN, USA
Statistical Process Control (SPC) for Coordinate Measurement Machines. Using SPC and Monitoring of Standard Artifacts to Determine and Control Measurement Uncertainty in a Controlled Environment
Escher, R. N.; 2002; 12 pp.; In English
Report No.(s): DE2002-752113; No Copyright; Avail: Department of Energy Information Bridge
The application of process capability analysis, using designed experiments, and gage capability studies as they apply to coordinate measurement machine (CMM) uncertainty analysis and control will be demonstrated. The use of control standards in designed experiments, and the use of range charts and moving range charts to separate measurement error into it's discrete

components will be discussed. The method used to monitor and analyze the components of repeatability and reproducibility will be presented with specific emphasis on how to use control charts to determine and monitor CMM performance and capability, and stay within your uncertainty assumptions.
NTIS
Statistical Analysis; Process Control (Industry); Reliability Engineering; Uncertain Systems; Experiment Design; Measuring Instruments

39
STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20030055677 Florida Univ., Gainesville, FL, USA
Combined Thermal and Structural Optimization of Functionally Graded Tile
Haftka, Raphael T.; Sankar, B. V.; [2003]; 2 pp.; In English
Contract(s)/Grant(s): NAG1-02067; No Copyright; Avail: CASI; A01, Hardcopy

The goal of our work was to investigate the use of functionally graded metal foam in thermal protection systems (TPS) and develop an understanding of the effect of varying density profile on the optimal TPS design. So far, two major tasks have been completed. The first is the optimization of TPS for minimum heat transmitted to the structure and the second is minimizing the mass of the TPS for a given aerodynamic heating. In both cases a steady state of heat transfer was assumed. The problem of minimum heat design is formulated as to minimize the heat transmitted through the foam insulation by varying density profile. The foam thickness, is equivalent to the problem of maximizing the outside temperature and hence maximizing the heat radiated out of the TPS. The optimality condition was obtained analytically. The optimal design requires minimum conductivity at each temperature through the thickness of insulation. The results show that using optimally graded insulation can lower heat transmitted to structure by 8-10\% compared to uniform insulation with same weight.
Author
Design Optimization; Metal Foams; Thermal Protection; Spacecraft Shielding; Spacecraft Equipment; Tiles; Heat Transfer

20030056584 NASA Langley Research Center, Hampton, VA, USA
Validation of Force Limited Vibration Testing at NASA Langley Research Center
Rice, Chad; Buehrle, Ralph D.; May 2003; 21 pp.; In English
Contract(s)/Grant(s): RTOP 992-35-05-04
Report No.(s): NASA/TM-2003-212404; L-18280; NAS 1.15:212404; No Copyright; Avail: CASI; A03, Hardcopy

Vibration tests were performed to develop and validate the forced limited vibration testing capability at the NASA Langley Research Center. The force limited vibration test technique has been utilized at the Jet Propulsion Laboratory and other NASA centers to provide more realistic vibration test environments for aerospace flight hardware. In standard random vibration tests, the payload is mounted to a rigid fixture and the interface acceleration is controlled to a specified level based on a conservative estimate of the expected flight environment. In force limited vibration tests, both the acceleration and force are controlled at the mounting interface to compensate for differences between the flexible flight mounting and rigid test fixture. This minimizes the over test at the payload natural frequencies and results in more realistic forces being transmitted at the mounting interface. Force and acceleration response data was provided by NASA Goddard Space Flight Center for a test article that was flown in 1998 on a Black Brant sounding rocket. The measured flight interface acceleration data was used as the reference acceleration spectrum. Using this acceleration spectrum, three analytical methods were used to estimate the force limits. Standard random and force limited vibration tests were performed and the results are compared with the flight data.
Author
Vibration Tests; Structural Vibration; Forced Vibration; NASA Programs; Acceleration (Physics)

20030056688 NASA Glenn Research Center, Cleveland, OH, USA
Damage Accumulation in SiC/SiC Composites with 3D Architectures
Morscher, Gregory N.; Yun, Hee-Mann; DiCarlo, James A.; [2003]; 16 pp.; In English; 27th Annual Cocoa Beach Conference

and Exposition, 26-31 Jan. 2003, Cocoa Beach, FL, USA; Original contains black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy

The formation and propagation of multiple matrix cracks in relatively dense ceramic matrix composites when subjected to increasing tensile stress is necessary for high strength and tough composites. However, the occurrence of matrix cracks at low stresses may limit the usefulness of some non-oxide composite systems when subjected to oxidizing environments for long times at stresses sufficient to cause matrix cracking. For SiC fiber-reinforced composites with two-dimensional woven architectures and chemically vapor infiltrated (CVI) SiC matrix and melt-infiltrated (MI) Si/SiC matrix composites, the matrix cracking behavior has been fairly well characterized for different fiber-types and woven architectures. It was found that the occurrence, degree, and growth of matrix cracks depends on the material properties of the composite constituents as well as other physical properties of the composite or architecture, e.g., matrix porosity and size of the fiber bundle. In this study, matrix cracking in SiC fiber reinforced, melt-infiltrated SiC composites with a 3D orthogonal architecture was determined for specimens tested in tension at room temperature. Acoustic emission (AE) was used to monitor the matrix cracking activity, which was later confirmed by microscopic examination of specimens that had failed. The determination of the exact location of AE demonstrated that initial cracking occurred in the matrix rich regions when a large z-direction fiber bundle was used. For specimens with large z-direction fiber tows, the earliest matrix cracking could occur at half the stress for standard 2D woven composites with similar constituents. Damage accumulation in 3D architecture composites will be compared to damage accumulation in 2D architecture composites and discussed with respect to modeling composite stress-strain behavior and use of these composites at elevated temperatures.

Author

Silicon Carbides; Ceramic Matrix Composites; Three Dimensional Composites; Damage; Crack Propagation; Mechanical Properties

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20030055639 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Landscape Analysis of One Ecological Corridors in the Mantiqueira Range

MaiaSantos, Janaina SantAna; 2003; 176 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-9553-TDI/829; Copyright; Avail: CASI; C01, CDROM; A09, Hardcopy

The long history of conversion of the forest land cover into agricultural land that took place in Southeastern Brazil resulted a landscape where the natural vegetation cover is reduced to patches with different sizes and spatial pattern. The fragmentation of the vegetation cover causes many deleterious effects to biological populations which depend on this habitat, such as population subdivision, increasing inbreeding rates and consequent genetic erosion, reduced resistance to disturbance and risk of local extinction. There are many initiatives to mitigate the consequences of habitat fragmentation, among which the maintenance or implementation of ecological corridors is one the proposals to reduce the loss of biological diversity. Ecological corridors are strips of natural habitat which connect habitat patches, allowing gene flux among patches and increasing the viability of biological populations. The objective of this work is to evaluate the hypothesis that the Brazilian legislation for land ordinance, the Brazilian Forest Protection Act, could maintain the existence of corridors and improve their functions as habitat and promoters of gene flux. The evaluation of the proposed hypothesis was made through the analysis of the impact of the application of some land cover regulation stated in the Forest Protection Act on the quality of the landscape of the crest of Mantiqueira Range as an ecological corridors between the Itatiaia National Park (INP) and States Park of Campos do Jordo (SPCJ) The present landscape of the region of the crest of Mantiqueira Range was stratified into seven forest fragments with size suitable for wildlife conservation, seven corridors, of which one represents an interruption in the SPCJ-INP corridor and six are narrow forest strips. A transition area between the SPCJ and a forest fragment was also discriminated. An alternative scenario was built in which some of the land cover regulation stated in the Brazilian Forest Protection Act simulating a landscape where the areas adjacent to the to the polygons of the present SPCJ-INP are in agreement with the Forest Protection Act. It was observed that the interruption in the SPCJ-INP corridor is no longer present in the alternative scenario and that habitat quality of the fragments and mainly of the corridors are significantly improved. The results confirms the hypothesis that the observation the regulations of the Forest Protection Act can maintain and enlarge the area of

existent native vegetation between PECJ and PNI, besides allowing the connection of fragments that are presently apart. Author

Vegetation; Forest Management; Forests; Brazil; Environment Effects; Deforestation

20030057172 Geological Survey, Reston, VA

Revised Protocols for Sampling Algal, Invertebrate, and Fish Communities as Part of the National Water-Quality Assessment Program

Moulton, S. R.; Kennen, J. G.; Goldstein, R. M.; Hambrook, J. A.; 2002; 92 pp.; In English

Report No.(s): PB2003-104448; USGS-OFR-02-150; No Copyright; Avail: CASI; A05, Hardcopy

Algal, invertebrate, and fish communities are characterized as part of ecological studies in the U.S. Geological Survey's National Water-Quality Assessment Program. Information from these ecological studies, together with chemical and physical data, provide an integrated assessment of water quality at local, regional, and national scales. Analysis and interpretation of water-quality data at these various geographic scales require accurate and consistent application of sampling protocols and sample-processing procedures. This report revises and unifies into a single document the algal, invertebrate, and fish community sampling protocols used in the National Water-Quality Assessment Program.

NTIS

Water Quality; Water Sampling; Methodology; Procedures

20030057174 Forest Service, Portland, OR

Recent Publications of the Pacific Northwest Research Station, Fourth Quarter 2002

Jan. 2003; 52 pp.; In English

Report No.(s): PB2003-103788; No Copyright; Avail: CASI; A04, Hardcopy

This document has a list of recent publications and other products of the Pacific Northwest (PNW) Research Station. Topics include bibliographies, economics, forest management, invertebrates, monitoring, plant ecology, resource inventory, silviculture; soil, site, geology, watershed management, wood utilization, aquatic/riparian systems, ecosystem structure and function, fire, fish, genetics, geomorphology and hydrology, land use, landscape geology, mycorrhizae, natural resource policy, plant pathology, range management, remote sensing, social sciences, and wildlife.

NTIS

Forest Management; Research Projects; Bibliographies

20030057179 Lawrence Livermore National Lab., Livermore, CA

THM Model Validation: Integrated Assessment of Measured and Predicted Behavior

Blair, S. C.; Carlson, S. R.; Wagoner, J.; Wagner, R.; Vogt, T.; Oct. 10, 2001; In English

Report No.(s): DE2003-15002505; UCRL-JC-145736; No Copyright; Avail: National Technical Information Service (NTIS)

This paper presents results of coupled thermal-hydrological-mechanical (THM) simulations of two field-scale tests that are part of the thermal testing program being conducted by the Yucca Mountain Site Characterization Project. The two tests analyzed are the Drift-Scale Test (DST) which is sited in an alcove of the Exploratory Studies Facility at Yucca Mountain, Nevada, and the Large Block Test (LBT) which is sited at Fran Ridge, near Yucca Mountain, Nevada. Both of these tests were designed to investigate coupled thermal-mechanical-hydrological-chemical (TMHC) behavior in a fractured, densely welded ash-flow tuff.

NTIS

Hydrology; Rock Mechanics; Geology; Computerized Simulation

20030057180 Forest Service, Portland, OR

Forests of Eastern Oregon: An Overview

Campbell, S.; Azuma, D.; Weyermann, D.; Apr. 2003; In English

Report No.(s): PB2003-104393; FSGTR-PNW-578; No Copyright; Avail: National Technical Information Service (NTIS)

This publication provides highlights of forest inventories and surveys from 1993 to 2001. About 35 percent of eastern Oregon is forested.The amount of forest land in eastern Oregon has increased by about 650,000 acres from the 1930s, with increases in juniper forest land accounting for most of the change. Thirty-one tree species were tallied in forest inventories during the 1990s, with ponderosa pine the predominant species in all ecological provinces in eastern Oregon.The Forest Service, Bureau of Land Management, and other federal agencies manage about 71 percent of eastern Oregon forests; about 27 percent is privately owned; and the remaining 2 percent is managed by the Oregon Department of Forestry and other

nonfederal public agencies.The volume of wood in eastern Oregon forests is about 25.7 billion cubic feet, of which about 312 million cubic feet per year were harvested between 1987 and 1999. In the same time period, annual mortality and removals exceeded annual growth for all ownerships. Down wood is an important forest component and shows increases with forest age. Insect defoliators, bark beetles, root diseases, and dwarf mistletoes are present on over 72 percent of forest land in eastern Oregon.Year-to-year defoliation or mortality trends can be detected with aerial surveys. Introduced plant species are present on over 50 percent of private and other public forest land. Diversity of lichens (indicators of air pollution, climate, and forest age and structure) is greatest in the Blue Mountains Province and lowest in the Intermountain Province. No ozone injury has been detected on sensitive forest trees and plant species in eastern Oregon.
NTIS
Land Management; Forests; Inventories; Air Pollution; Defoliation

20030057181 Forest Service, Portland, OR
Proceedings: Hidden Forest Values. The First Alaska-Wide Nontimber Forest Products Conference and Tour
Mar. 2003; 164 pp.; In English, November 8 - 11, 2001, Anchorage, Alaska
Report No.(s): PB2003-104394; FSGTR-PNW-579; No Copyright; Avail: CASI; A08, Hardcopy

The Hidden Forest Values Conference brought together a diverse assemblage of local, state and federal agencies, tribal governments, traditional users, landholders, cottage enterprises and other Nontimber Forest Products (NTFP) related businesses, scientists, and experts. The purpose of this forum was to exchange information, cooperate, and raise awareness of issues on sustainable and equitable, environmentally and economically viable opportunities for NTFP in Alaska. This discourse sought a balance of development and sustainability, with respect for traditional uses. Nontimber Forest Products were defined by the Conference organizers as biological material harvested from the forest that has not been produced from commercially sawn wood such as lumber, pulp, and paper. These proceedings include extended summaries of presentations by speakers and panelists at the conference.
NTIS
Forests; Governments; Commerce

20030057186 Missouri Univ., Rolla, MO, USA
Vertical Shear-Wave Velocity Profiles Generated from Spectral Analysis of Surface Waves: Field Examples
Anderson, N.; Chen, G.; Kociu, S.; Luna, R.; Thitimakorn, T.; Apr. 2003; In English
Report No.(s): PB2003-104457; RDT-03-006; No Copyright; Avail: National Technical Information Service (NTIS)

Surface wave (Rayleigh wave) seismic data were acquired at six separate bridge sites in southeast Missouri. Each acquired surface wave data set was processed (spectral analysis of surface waves; SASW) and transformed into a site-specific vertical shear-wave velocity profile (SASW shear-wave velocity profile). The SASW shear-wave velocity profiles generated for each bridge site were compared to other geotechnical data including seismic cone penetrometer shear-wave velocity profiles, cross-borehole shear-wave velocity profiles, and borehole lithology logs. The geotechnical data presented herein indicate the SASW shear-wave velocity profiles correlate well with subsurface lithology logs and available cross-borehole shear-wave velocity control. More specifically, clays, silts and sands exhibit relatively characteristic SASW shear-wave velocities, which increase incrementally with increasing depth of burial. We believe these correlations demonstrate that SASW shear-wave velocities are reliable.
NTIS
Surface Waves; Rayleigh Waves; Spectrum Analysis; Velocity Distribution; Seismic Waves

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20030055636 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Integration of Remote Sensing, Geologic, Gravity and Topographic Data for the Study of the Structural Framework of the Northeastern Compartment of the Reconcavo Basin
Beisl, Carlos Henrique; [2003]; 130 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-9611-TDI/841; Copyright; Avail: CASI; C01, CDROM; A07, Hardcopy

This work discusses the analysis of multisource data in the study of the structural-tectonic framework of the northeastern portion of the Reconcavo Basin. To achieve this goal, a geocoded digital dataset of remote sensing, topographic, geologic (surface and subsurface) and Bouguer gravity data was assembled using Geographic Information System techniques. The integrated analysis of multisource data highlighted several geologic/geophysical features in the study area. The comparison among remote sensing derived lineaments and gravity data permitted to identify several features of the structural framework of the area. The structural information obtained by integration techniques were analyzed together with the seismic structural map of the top of Brotas Group. This pre-rift stratigraphic unit represents the structural-tectonic framework of the Reconcavo Basin. The comparison among conglomerates of the Salvador Formation and the residual gravity data indicated the flow of coarse clastic sediments near the Salvador Fault. The results show that the digital data integration is a valuable approach in the geologic exploration of sedimentary basins, permitting a better knowledge of their structural framework.
Author
Data Integration; Digital Data; Terrain Analysis; Structural Properties (Geology); Remote Sensing

20030055637 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Automatic Registration and Mosaicking System for Remotely Sensed Imagery
Fedorov, Dimitri; 2003; 155 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-9582-TDI/838; Copyright; Avail: CASI; C01, CDROM; A08, Hardcopy

Image registration is an important operation in remote sensing applications that basically involves the identification of many control points in the images. As the manual identification of control points may be time-consuming and tedious several automatic techniques have been developed. This paper describes a system for automatic registration and mosaic of remote sensing images under development at the Division of Image Processing (National Institute for Space Research - INPE) and the Vision Lab (Electrical & Computer Engineering department, UCSB). Three registration algorithms, which showed potential for multisensor or temporal image registration, are implemented. The system is designed to accept different types of data and information provided by the user that are used to speed up the processing or avoid mismatched control points. Based on a statistical procedure used to characterize good and bad registration, the user can stop or modify the parameters and continue the processing. Extensive algorithm tests have been performed by registering optical, radar, multisensor, high-resolution images and video sequences. Furthermore, the system has been tested by remote sensing experts at INPE using full scene Landsat, JERS-1, CBERS-1 and aerial images. A system online demo that contains several examples that can be executed using web browser is available.
Author
Pattern Registration; Remote Sensing; Image Processing; Algorithms; Image Reconstruction

20030055638 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Use of SAR Coherence Image for Land Cover Classification: Tapajos National Forest
Gaboardi, Clovis; [2003]; 139 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-9612-TDI/842; Copyright; Avail: CASI; C01, CDROM; A07, Hardcopy

The use of optical remote sensing images is not adequate for land cover classifying in tropical environments, due to the constant presence of clouds. The SAR images may be used under any weather and visibility conditions; however, the C-band SAR images have not been considered proper for performing the mapping of forest regions on account of the fact that their wavelength is around the greatness of the leaves from the trees, which increases the speckle phenomenon. This work aims to analyze the potentialities of the use of the coherence images as an alternative for making the classification of the forested areas of tropical regions in the C-band. The use of coherence images is justified by the fact that a low coherence is expected in forest regions, when compared to regions containing sparse vegetation and bare soil. The coherence image of the National Forest of Tapajos has been used, which was obtained from the images captured by the satellites ERS-1/2 in the tandem mode. In order to make the comparison of the results, the amplitude image of the same scene, acquired by the satellite ERS-1 was used, as well as a texture band selected from the 14 Haralick features. Statistical tests based upon Kappa statistics were used to test the precision and the significance of the results.
Author
Radar Imagery; Remote Sensing; Terrain Analysis; Image Processing; Image Analysis; Vegetation; Synthetic Aperture Radar

20030055641 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Evolution of the Land Use in Portion of the Occidental Amazon (Acre), with Use of Changes Detection Technique

Lorena, Rodrigo Borrego; [2003]; 116 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-9650-TDI/846; Copyright; Avail: CASI; C01, CDROM; A06, Hardcopy

The Brazilian Amazon has been objective of activities that are transforming extensive areas of humid tropical forest in areas destined to the agriculture and pastures, contributing to the alteration of the atmosphere and of the Amazon landscape. Starting from the decade of 60, the state of Acre, started to suffer great pressure through the migration and people's of other areas of the country establishment, resulting in environmental and socioeconomic problems of great proportions. By that diversity of situations, it became of fundamental importance the monitoring of form sequential of the use of the earth and of the vegetable covering, so that she can determine the evolution of the occupation of the area. This way, inside of the context of the project PPG 7 - FINEP 123/-00/99, of monitoring of the dynamics of landscapes of the Amazonian, the present work had for general objective, to analyze some techniques of digital processing of orbital images that could contribute in studies of dynamics of the vegetable covering and use of the soil. The Change Vector Analysis (CVA) was used as a technique of the change detection, and in compensation, the traditional technique of classification for areas Bhattacharyya, in that study of the dynamics of the use and of the covering of the earth of the area of Peixoto, state of Acre, being used multitemporal and multiespectral data of TM/Landsat, updated and consubstantiates with information collected in field work. The results demonstrated the efficiency of the classification algorithm in discriminating different objective types (such as forest, cultures, pastures and capoeiras), as well as the capacity of the technique Analysis for Change of Vector in stratifying different thematic types of modifications related to the use of the earth and the vegetable covering of the area.

Author

Land Use; Vegetative Index; Amazon Region (South America); Remote Sensing; Change Detection; Image Processing; Vector Analysis; Digital Data

20030056591 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Spatial and Temporal Variability of NDVI Over Brazil and Its Connections with the Climate

daCostaGurgel, Helen; 2003; 120 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-9655-TDI/848; Copyright; Avail: CASI; C01, CDROM; A06, Hardcopy

This work studies the connections between Normalized Difference Vegetation Index (NDVI) and annual and interanual climatic variabilities over Brazil. For this purpose, NDVI and Outgoing Longwave Radiation (OLR) data, obtained from National Oceanic and Atmospheric Administration - Advanced Very High Resolution Radiometer (NOAA-AVHRR) between January/82 and December/93, were analyzed. To accomplish this study, Cluster and Principal Component Analysis (PCA) were the statistical tools used, as well as monthly and seasonal means, and annual anomalies. PCA was done at both NDVI and OLR data, in contrast to Cluster analysis, which was applied only to NDVI data. The obtained results point that the means and anomalies at OLR data and the PCA, allow a climatic characterization in space and time of the main climatic systems that act on Brazil. In relation to the PCA, it was observed that the first component represents the mean pattern of convective activity; second and fourth components are associated to the summer/winter and spring/autumn modes of the annual cycle; the third component shows the variations modulated by El Nino's events, and the fifth component is associated with the semi-annual cycle. The cluster analysis of NDVI data, sorted seven great vegetation groups that appear in Brazil and showed the annual and interanual variation, as well as these groups' response time to precipitation. The PCA of NDVI demonstrated the potentiality of this variable in characterizing the main features of vegetation that prevail in the Brazilian territory. In addition, annual and interannual variability of these vegetation groups related to the climatic variability (components 1, 2 and 3), was characterized. PCA also revealed the main non-climatic factors that disturbs NDVI, which are: the occurrence of burns, NOAA s satellites period delays and the changes of NOAA s satellites 9 and 11 (components 4, 5, 6 and 10). The high values of correlations obtained among the eigenvectors, resultants from PCA of OLR and NDVI data, that correspond to summer/winter (r = 0.91) and spring/autumn (r = 0.70) modes, indicate that the annual variability of Brazilian vegetation cover is largely modulated by the climatic regime. The obtained results suggest that the statistical techniques used in this work, proved to be useful tools to characterize events of periodic and non-periodic changes in temporal series data collected by remote sensing.

Author

Remote Sensing; Brazil; Temporal Distribution; Spatial Distribution; Vegetation; Climatology; Annual Variations; Normalized Difference Vegetation Index

20030056608 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Passive and Active Microwave Remote Sensing of Precipitation and Latent Heating Distributions in the Tropics from TRMM

Olson, William S.; Kummerow, Christian D.; Yang, Song; Haddad, Ziad S.; Tao, Wei-Kuo; Wang, Yansen; Lang, Stephen E.; Braun, Scott A.; Chiu, Christine; Wang, Jian-Jian; [2002]; 1 pp.; In English; International TRMM Science Conference, 22-26 Jul. 2002, Honolulu, HI, USA; Copyright; Avail: Other Sources; Abstract Only

Passive and active microwave remote sensing data are analyzed to identify signatures of precipitation and vertical motion in tropical convection. A database of cloud/radiative model simulations is used to quantify surface rain rates and latent heating profiles that are consistent with these signatures. At satellite footprint-scale (approximately 10 km), rain rate and latent heating estimates are subject to significant random errors, but by averaging the estimates in space and time, random errors are substantially reduced, Bias errors have been minimized by improving the microphysics in the supporting cloud/radiative model simulations, and by imposing a consistent definition of remotely-sensed and model-simulated convective/stratiform rain coverage. Remotely-sensed precipitation and latent heating distributions in the tropics are derived from Tropical Rainfall Measuring Mission (TRMM) and Special Sensor Microwave/ Imager (SSM/ I) sensor data. The prototype Version 6 TRMM passive microwave algorithm typically yields average heating profiles with maxima between 6 and 7 km altitude for organized mesoscale convective systems. Retrieved heating profiles for individual convective systems are compared to coincident estimates based upon a combination of dual-Doppler radar and rawinsonde data. Also, large-scale latent heating distributions are compared to estimates derived from a simpler technique that utilizes observations of surface rain rate and stratiform rain proportion to infer vertical heating structure. Results of these tests will be presented at the conference.
Author

Remote Sensing; Heat Transfer; Tropical Regions; Vertical Motion; Rain; Microwave Signatures; Radar Signatures; Microwave Imagery

20030056638 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Ocean Surface Circulation Estimated by the Maximum Cross-Correlation Technique

deOliveira, Eduardo Negri; [2003]; 104 pp.; In English; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-9583-TDI/839; Copyright; Avail: CASI; C01, CDROM; A06, Hardcopy

The Maximum Cross Correlation Method (MCC) is applied to AVHRR/NOAA thermal image pairs to estimate the surface advective velocity fields derived from oceanic thermal features. The images are divided into template and search windows. The maximum cross-correlation between these windows is calculated to obtain the displacement vector of the tracked features in the windows. In order to achieve the best results, it is necessary that both images are accurately registered; a maximum of two pixels of mismatch is allowed. The basic assumption of the MCC method is that the thermal features are displaced by advective processes. Rotational and deformation processes are considered small enough to be neglected. This hypothesis is considered valid for time intervals of less than 24 hours between two images used in the method. The statistical confidence for the cross-correlation coefficient is determined using the Emery et al.(1986) and Wu et al. (1992) methodologies. The technique of Vector Median Filter has been applied to remove spurious velocity vectors.
Author

Cross Correlation; Data Correlation; Imaging Techniques; Pattern Registration; Ocean Dynamics; Statistical Analysis

20030056702 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Parallel Implementation of Contextual Classifier for Remote Sensing Images

TabordadeAlmeida, Rui Nelson; 2001; In Portuguese; CD-ROM contains 4 PDF's that could not be combined into one and also contains color.

Report No.(s): INPE-8534-TDI/785; Copyright; Avail: CASI; C01, CDROM

This work presents basic concepts about digital image processing, with emphasis on classification of images from multi-spectral sensors. We have chosen two classification algorithms (MAXVER and ICM), to exemplify the application of the proposed methodologies. Before showing these methodologies, we evaluated the situation of present algorithms, in the SPRING system. We described the aspects related to parallel systems and the standard of communication by Message Passing Interface (MPI). We adjusted the current programs (sequential) to be executed outside of the SPRING system. The objective was to optimize the tests and the evaluation of the results. From the code of these programs, we developed able versions to classify images using parallel processing, based on message passing interface with MPI. During the development of the programs, the objective was to increase the classification performance, using a portable code across parallel systems. The new programs were tested in parallel systems with different architectures. We used both images with low and with high volume

of information. We calculated the times of processing in regard to aspects such as: selected algorithm, communication, I/O, information volume, etc. The parallel programs were evaluated in their aspects of performance and efficiency. To assess the quality of the results, we compared the resulting images of the parallel case with the resulting images of the sequential case. We confirmed that the classification can be optimized, with reduction of processing time. Furthermore, the developed programs can be used in parallel systems with different architectures, without changes in their original code. Thus, we concluded that the methodologies used in this work are very important to the development of systems for image processing. Author

Remote Sensing; Image Classification; Image Processing; Digital Techniques; Multispectral Band Scanners

20030057123 Edgerton, Germeshausen and Grier, Inc., Wallops Island, VA, USA

[Progress of the ATM Crew]

[2003]; 16 pp.; In English

Contract(s)/Grant(s): NAS5-99094; No Copyright; Avail: CASI; A03, Hardcopy

Activities for each of the following programs are discussed in separate sections for the bimonthly reporting period: Airborne Oceanographic Lidar (AOL); Airborne Topographic Mapper (ATM); Other Mission Support Activities, including modeling activities, EAARL activities, and the Scanning Radar Altimeter (SAR); Tropical Rain Measuring Mission (TRMM). The tasks undertaken for each program are discussed in the pertinent section of the report.

CASI

Airborne Lasers; Ocean Data Acquisitions Systems; Optical Radar; Radio Altimeters; Trmm Satellite; Global Positioning System; Mapping; Oceanography; Remote Sensors

20030057164 National Defence Research Establishment, Umea, Sweden

Investigation of Soil and Groundwater at Nammo Liab, Lindesberg

Qvarfort, U.; Waleij, A.; Jan. 2002; In Swedish

Report No.(s): PB2003-103214; FOI-R-0240-SE; No Copyright; Avail: National Technical Information Service (NTIS)

On behalf of Nammo LIAB AB, the Swedish Defense Research Agency has performed an environmental risk assessment of the industrial site at Hermanstorp 7:1, Lindesberg. It was performed in accordance with the Swedish EPA method MIFO and consisted of two phases. In a previous Phase 1, eight objects were identified as requiring further investigation. The present investigation consists of a Phase 2 study of the above-mentioned objects. The risk assessment was based on the results from the soil and water analyses. Three objects were classified as Risk Level 2, namely the combustion area (object 3), the fire rescue pond (object 4) and a destruction site (object 8), since they showed fairly high levels of either heavy metals or explosives. The report suggests how to take further actions. The remaining objects were classified as Risk Level 3, i.e. requiring no further actions.

NTIS

Fires; Ground Water; Heavy Metals; Soils

20030057201 Begeleidingscommissie Remote Sensing, Delft, Netherlands

Earth Observation for Environmental Impact Assessment in Irrigation and Drainage Projects. A Demonstration Project for the Tungabhadra Irrigation Pilot Project II, India

Bakker, M.; Bastiaanssen, W.; 2002; In English

Report No.(s): PB2003-102894; NRSP-2-99-13; No Copyright; Avail: National Technical Information Service (NTIS)

The Tungabhadra Irrigation Pilot Project II (TIPP II) has been initiated in order to assess the problems following from irrigation and drainage activities. A conventional Environmental Impact Assessment (EIA) was performed by DHV Consultants in 1997, from which it was concluded that the main problems in the project area are: water logging due to drainage problems; increased soil salinity; and an unequal distribution of irrigation water among farmers due to head and tail differences. The conventional method for executing an EIA however, was very expensive and time-consuming and the accuracy was questionable. In order to provide the Irrigation and Drainage department of DHV Consultants with a more cost and time efficient tool for EIA with a higher accuracy, the contribution of Earth Observation in EIA has been demonstrated. Satellite images cover large areas, contain detailed information on spatial and spectral characteristics, and are topographically very accurate (provided that they are georeferenced correctly). This report describes the execution and results of a demonstration of a Remote Sensing (RS) based EIA for the TIPP II project in India. The project has successfully demonstrated

that RS based EIA result in significant lower costs, significant higher accuracy of the assessment and marginal time savings compared to conventional EIA.
NTIS
Earth Observations (From Space); Environmental Surveys; Irrigation; Drainage; Satellite Imagery

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*; and *28 Propellants and Fuels*.

20030057171 Department of Energy, Washington, DC, USA, Interior Dept., Washington, DC
White House Report in Response to the National Energy Policy Recommendations to Increase Renewable Energy Production on Federal Lands
Aug. 2002; In English
Report No.(s): PB2003-104439; No Copyright; Avail: National Technical Information Service (NTIS)

The National Energy Policy Development Group recommended to the President in May 2001, that our departments work together to re-evaluate access limitations to Federal lands in order to increase renewable energy production. In response, the departments of the Interior, Energy, Agriculture, and Defense created an interagency task force to address the issues associated with increasing renewable energy production on Federal lands.
NTIS
Energy Policy; Renewable Energy

20030057175 Battelle Columbus Labs., OH, USA
Application, Performance, and Costs of Biotreatment Technologies for Contaminated Soils
Goetz, J.; Sep. 2002; 128 pp.; In English
Report No.(s): PB2003-104482; No Copyright; Avail: CASI; A07, Hardcopy

The U.S. Environmental Protection Agency's (EPA's) Office of Research and Development (ORD) has devoted considerable effort over the last two decades to advancing the understanding of appropriate applications of bioremediation. Over the years, research direction has transitioned from substantial emphasis on mechanistic studies to a greater emphasis on evaluation of bioprocesses in the field. The initial research impetus provided the background information necessary for successful field applications, and was accomplished collectively through in-house research studies and cooperative research projects with public and private research institutes. The field efforts are conducted through the Bioremediation in the Field Program, supported by EPA/ORD, EPA's Office of Solid Waste and Emergency Response (OSWER), and the EPA Regions through the Superfund Innovative Technology Evaluation (SITE) Program and Cooperative Research and Development Agreements (CRADAs) with companies. This two-phase program has resulted in the development of cost-effective technical approaches to site cleanup that have been validated in the field.
NTIS
Biodegradation; Environment Protection; Cost Effectiveness; Soil Pollution

20030057209 National Energy Technology Lab., Morgantown, WV, USA
Fuel Cell Handbook, Sixth Edition (on CD-ROM)
Nov. 2002; In English
Report No.(s): PB2003-500048; No Copyright; Avail: National Technical Information Service (NTIS)

Fuel cells are an important technology for a potentially wide variety of applications including micropower, auxiliary power, transportation power, stationary power for buildings and other distributed generation applications, and central power. These applications will be in a large number of industries worldwide. In the Sixth Edition of the Fuel Cell Handbook, we have included over 5,000 fuel cell patent abstracts and their claims. In addition, the handbook features a new fuel cell power conditioning section, and overviews on the hydrogen industry and rare earth minerals market. Finally, an updated list of fuel cell URL's is included in the Appendix and an updated index assists the reader in locating specific information quickly.
NTIS
Fuel Cells; Manuals

20030057275 Lawrence Livermore National Lab., Livermore, CA

Sensor Needs and Requirements for Proton-Exchange Membrane Fuel Cell Systems and Direct-Injection Engines

Jan. 2000; 152 pp.; In English

Report No.(s): DE2003-792431; No Copyright; Avail: Department of Energy Information Bridge

On January 25 and 26, 2000, the Department of Energy (DOE) Office of Advanced Automotive Technologies (OAAT) sponsored a workshop on sensor needs for automotive fuel cell systems; compression-ignition, direct-injection (CIDI) engines; and spark-ignition, direct-injection (SIDI) engines. These technologies are being developed by OAAT under the Partnership for a New Generation of Vehicles (PNGV), a government-industry collaboration to develop vehicles having up to three times the fuel economy of todays mid-size automobiles. The purpose of the workshop was to draw upon the expertise of the fuel cell development community, the DI engine community, and sensor researchers and manufacturers to define the needs and technical targets for sensors, and to aid DOE in identifying and prioritizing R&D activities in those areas. Sensors enhancing both proton-exchange membrane (PEM) fuel cell and CIDI/SIDI engine performance were of interest, as well as those for use in emission control, and for passenger safety. The objectives of the workshop were to: define the requirements for sensors; establish R&D priorities; identify the technical targets and technical barriers; and facilitate collaborations among participants. The recommendations from this workshop will be incorporated into the multi-year R&D plan of the DOE Office of Advanced Automotive Technologies.

NTIS

Sensors; Diesel Engines; Energy Technology; Fuel Cells; Spark Ignition

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20030055635 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

The Aerosol Optical Thickness in the UV-B Band

AntoniodaSilva, Abel; 2002; 139 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-8754-TDI/797; Copyright; Avail: CASI; C01, CDROM; A07, Hardcopy

Solar ultraviolet radiation from 280 to 320 nm (UV-B) strikes at Earth atmosphere and is affected by several processes until it reaches the surface. Ozone and aerosols in the atmosphere are important local factors interacting with UV-B. At three sites in South America Natal and Campo Grande in Brazil, and La Paz in Bolivia a field campaign was conducted in August 1999. The main goal of the campaign was to measure the aerosol optical thickness at UV-B range using direct sun (ds) measurements of the Brewer spectrophotometer. A 24 hour advanced noon UV-B forecasting algorithm called Uvdiag was developed which takes into account ozone column, solar zenith angle (SZA), height, latitude, longitude and cloud cover in Brazil.

Author

Solar Radiation; Aerosols; Atmospheric Circulation; Atmospheric Composition; Optical Thickness; Brazil; Air Pollution

20030057155 Federal Highway Administration, McLean, VA, USA

Modifications of Highway Air Pollution Models for Complex Site Geometries, Volume 1, Data Analysis & Model Development

September 2002; 250 pp.; In English

Report No.(s): PB2003-103349; FHWA/RD-02/036; No Copyright; Avail: CASI; A11, Hardcopy

The study is an evaluation of flow pattern and dispersion of air contaminants for complex site geometries, such as semi-confined, cut-section highways and urban street canyons. Highway vehicle exhaust entrainment, air contaminant dispersion, and impacts from contaminants for such locations are in contrast to those noted from field, wind tunnel, and related models for flat, open sites and can be significantly important in environmental assessments.

NTIS

Air Pollution; Environment Models; Highways; Flow Distribution; Dispersion

20030057162 Office of Air Quality Planning and Standards, Research Triangle Park, NC
Clean Air Act Confidential Business Information Security Manual
Mar. 2003; 94 pp.; In English
Report No.(s): PB2003-104483; EPA/450/B-03/001; No Copyright; Avail: CASI; A05, Hardcopy

The procedures in this manual provide Federal, Contractor, and Subcontractor employees with the information necessary to utilize Confidential Business Information (CBI) in the performance of their assigned duties without violating applicable Federal regulations protecting the rights of its owners in accordance with the Clean Air Act of 1990 (CAA) as amended.
NTIS
Air Quality; Information Management; Computer Information Security; Regulations

20030057167 Lawrence Livermore National Lab., Livermore, CA
Development of a Quantitative TaqMan(trademark): PCR Assay and Feasibility of Atmospheric Collection for Coccidioides immitis for Ecological Studies
Daniels, J. I.; Wilson, W. J.; DeSantis, T. Z.; Gouveia, F. J.; Anderson, G. L.; Sep. 14, 2001; 30 pp.; In English
Report No.(s): DE2003-15002759; UCRL-ID-146977; No Copyright; Avail: Department of Energy Information Bridge

In this study, the unique capabilities in biotechnology and environmental science available at Lawrence Livermore National Laboratory (LLNL) are combined with the distinguished and highly regarded expertise for clinically investigating and treating infectious disease at the Department of Microbiology and Immunology in the School of Medicine of the University of California, Davis, in order to develop, standardize, validate, and test safely the feasibility of applying advanced polymerase chain reaction (PCR) technology and new air-sample collection media that would be appropriate for addressing comprehensively the environmentally linked, medically important infectious disease Valley Fever (coccidioidomycosis). The responsible agent for this disease is the airborne spore (arthroconidia) of the pathogenic fungus Coccidioides immitis, which is a microorganism that is endemic to California, Arizona, and the southwestern USA, and also is identified as a select (biological) agent in the federal Anti-Terrorist und Effective Death Penalty Act. Successful demonstration of these tools in this study will place this multidisciplinary team in a credible position to proceed with additional research designed to determine the climatic signals and ecological triggers that would be associated with the presence of this microorganism environmentally and that would correlate with subsequent outbreaks of Valley Fever clinically. Results from such future research would then provide the information needed for environmental intervention of the disease occurrence, well before clinical cases appear. The technology and modeling developed for such a study also could be used for determining the ecology of other environmentally linked, medically important infectious diseases that occur naturally or that might be introduced deliberately into environmental media indoors or outside.
NTIS
Assaying; Biotechnology; Ecology; Immunology; Infectious Diseases; Feasibility Analysis; Chain Reactions (Chemistry)

20030057187 National Inst. for Occupational Safety and Health, Cincinnati, OH, USA
Dioxin Registry Report for Hercules, Inc. and Vertac Chemical Corporation Jacksonville, Arkansas, January 1991
Marlow, D. A.; Fingerhut, M. A.; Blade, L. M.; Hearn, S.; Jones, J.; January 1991; 68 pp.; In English
Report No.(s): PB2003-103783; REPT-117.10; No Copyright; Avail: CASI; A04, Hardcopy

This site, which was last operated by Vertac Chemical Corporation produced 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and its esters and amines from 1957 through 1979. Presented is a compilation of demographic and work history information, process information, and analytical data pertaining to 2,4,5-T production. This information was collected over several site visits and visits to corporate headquarters by several investigators.
NTIS
Amines; Esters

20030057191 National Science and Technology Council, Washington, DC, USA
Preliminary Survey of Air Quality and Related Health Studies Conducted in the Vicinity of Ground Zero
Dec. 2002; 50 pp.; In English
Report No.(s): PB2003-104414; No Copyright; Avail: CASI; A03, Hardcopy

The collapse of the World Trade Center buildings as a result of the terrorist attacks of September 11, 2001 produced an enormous dust plume that persisted for several days. Additional air pollution was generated by fires at the site and by the debris removal process. In the wake of this tragedy, there has been concern for the health of workers involved in the rescue and clean-up efforts and for the people whose homes and places of work are in the immediate area and who may have been exposed

to this pollution. As a consequence, a number of studies have been conducted by local, State, and Federal agencies to better quantify the impacts of the attacks on local air quality and related health issues.
NTIS
Air Pollution; Air Quality

20030057192 Begeleidingscommissie Remote Sensing, Delft, Netherlands
Surface Cover Related Input Data for 3-D Atmospheric-Chemistry Models
Nijenhuis, W. A. S.; Groten, S. M. E.; Nov. 1999; In English
Report No.(s): PB2003-102895; NRSP-2-99-11; No Copyright; Avail: National Technical Information Service (NTIS)

The goal of the current project is to evaluate and demonstrate the improvement of 3-D atmospheric chemistry models by implementing appropriate temporal and spatial land cover data derived from remote sensing. This is qualitatively done by using the LOng Term Ozone Simulation model (LOTOS). In this model new biogenic emission data and dry deposition parameters have been implemented.
NTIS
Remote Sensing; Atmospheric Chemistry; Ozone; Cost Analysis; Cost Effectiveness

20030057255 Argonne National Lab., IL, USA
Effects of Fuel Ethanol Use on Fuel-Cycle Energy and Greenhouse Gas Emissions
Wang, M.; Saricks, C.; Santini, D.; Jan. 1999; 44 pp.; In English
Report No.(s): DE2003-4742; ANL/ESD-38; No Copyright; Avail: Department of Energy Information Bridge

We estimated the effects on per-vehicle-mile fuel-cycle petroleum use, greenhouse gas (GHG) emissions, and energy use of using ethanol blended with gasoline in a mid-size passenger car, compared with the effects of using gasoline in the same car. Our analysis includes petroleum use, energy use, and emissions associated with chemicals manufacturing, farming of corn and biomass, ethanol production, and ethanol combustion for ethanol; and petroleum use, energy use, and emissions associated with petroleum recovery, petroleum refining, and gasoline combustion for gasoline. For corn-based ethanol, the key factors in determining energy and emissions impacts include energy and chemical usage intensity of corn farming, energy intensity of the ethanol plant, and the method used to estimate energy and emissions credits for co-products of corn ethanol. The key factors in determining the impacts of cellulosic ethanol are energy and chemical usage intensity of biomass farming, ethanol yield per dry ton of biomass, and electricity credits in cellulosic ethanol plants.
NTIS
Combustion; Ethyl Alcohol; Exhaust Emission; Fuels

20030057257 Brookhaven National Lab., Upton, NY, USA
Compilation and Analyses of Emissions Inventories for NOAA's Atmospheric Chemistry Project
Benkovitz, C. M.; Mubaraki, M. A.; Sep. 1997; In English
Report No.(s): DE2003-750761; BNL-64848; No Copyright; Avail: National Technical Information Service (NTIS)

Global inventories of anthropogenic emissions of oxides of nitrogen (NO(sub x)) for circa 1985 and 1990 and Non-Methane Volatile Organic Compounds (NMVOCs) for circa 1990 have been compiled by this project. Work on the inventories has been carried out under the umbrella of the Global Emissions Inventory Activity (GEIA) of the International Global Atmospheric Chemistry (IGAC) Program. The 1985 NO(sub x) inventory was compiled using default data sets of global emissions that were refined via the use of more detailed regional data sets; this inventory is being distributed to the scientific community at large as the GEIA Version 1A inventory. Global emissions of NO(sub x) for 1985 are estimated to be 21 Tg N y(sup -1), with approximately 84\% originating in the Northern Hemisphere. The 1990 inventories of NO(sub x) and NMVOCs were compiled using unified methodologies and data sets in collaboration with the Netherlands National Institute of Public Health and Environmental Protection (Rijksinstituut Voor Volksgezondheid en Milieuhygiene, RIVM) and the Division of Technology for Society of the Netherlands Organization for Applied Scientific Research, (IMW-TNO); these emissions will be used as the default estimates to be updated with more accurate regional data. The NMVOC inventory was gridded and speciated into 23 chemical categories. The resulting global emissions for 1990 are 31 Tg N yr(sup -1) for NO(sub x) and 173 Gg NMVOC yr(sup -1). Emissions of NO(sub x) are highest in the populated and industrialized areas of eastern North America and across Europe, and in biomass burning areas of South America, Africa, and Asia. Emissions of NMVOCs are highest in biomass burning areas of South America, Africa, and Asia. The 1990 NO(sub x) emissions were gridded to 1(sup o) resolution using surrogate data, and were given seasonal, two-vertical-level resolution and speciated into NO and NO(sub 2) based on proportions derived from the 1985 GEIA Version 1B inventory. Global NMVOC emissions were given additional

species resolution by allocating the 23 chemical categories to individual chemical species based on factors derived from the speciated emissions of NMVOCs in the U.S. from the U.S. EPA's 1990 Interim Inventory. Ongoing research activities for this project continue to address emissions of both NO(sub x) and NMVOCs. Future tasks include: (a) evaluation of more detailed regional emissions estimates and update of the default 1990 inventories with the appropriate estimates, (b) derivation of quantitative uncertainty estimates for the emission values, and (c) development of emissions estimates for 1995.
NTIS
Inventories; Atmospheric Chemistry; Emission; Nitrogen Oxides; Atmospheric Composition; Volatile Organic Compounds

46
GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20030055633 Dartmouth Coll., Hanover, NH, USA
Sounding of the Ion Energization Region: Resolving Ambiguities
LaBelle, James; June 06, 2003; 2 pp.; In English
Contract(s)/Grant(s): NAG5-5238; No Copyright; Avail: CASI; A01, Hardcopy

Dartmouth College provided a single-channel high-frequency wave receiver to the Sounding of the Ion Energization Region: Resolving Ambiguities (SIERRA) rocket experiment launched from Poker Flat, Alaska, in January 2002. The receiver used signals from booms, probes, preamplifiers, and differential amplifiers provided by Cornell University coinvestigators. Output was to a dedicated 5 MHz telemetry link provided by WFF, with a small amount of additional Pulse Code Modulation (PCM) telemetry required for the receiver gain information. We also performed preliminary analysis of the data. The work completed is outlined below, in chronological order.
Author
Earth Ionosphere; Ionospheric Sounding; Sounding Rockets; Energetic Particles; Ions

20030056692 California Univ., Los Angeles, CA, USA
Current Disruption During November 24, 1996, Substorm
ElAlaoui, Mostafa; Journal of Geophysical Research; April 2001; Volume 106, No. A4, pp. 6229-6245; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-9255; NAG5-6689; Copyright; Avail: Other Sources

This study uses global magnetohydrodynamic (MHD) simulations driven by solar wind data along with Geotail, Interball, and IMP 8 observations of the magnetotail to investigate the dynamics of the near-Earth plasma sheet during a substorm that occurred on November 24, 1996. The MHD simulation shows that prior to the onset of the substorm, the magnitude of the current density decreases in a small region in the near-Earth plasma sheet. During and after the substorm onset this region of weak current becomes larger and more pronounced, expanding dawnward, duskward, upward, downward, and tailward. Part of the cross-tail current is redirected to the ionosphere via an earthward field-aligned current on the dawnside and a tailward return current on the duskside. The simulation showed that the field-aligned current was associated with velocity shear and flow vortices.
Author
Magnetohydrodynamics; Computerized Simulation; Geomagnetic Tail; Polar Substorms; Plasma Layers

20030056701 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Determination of Surface Salinity with SMOS: Recent Results and Main Issues
Font, J.; Lagerloef, G.; LeVine, D.; Camps, A.; [2003]; 1 pp.; In English; IGARSS Conference, 21-25 Jul. 2003, Toulouse, France; Copyright; Avail: Other Sources; Abstract Only

SMOS (Soil Moisture and Ocean Salinity) is the second of the European Space Agency Earth Explorer Opportunity Missions, due for launch in late 2006. It uses an L-band microwave interferometric radiometer to retrieve both geophysical variables. A lot of experimental and theoretical work on salinity retrieval from L-band measurements has been done since the submission of the SMOS proposal to ESA in November 1998. Several studies and campaigns sponsored by ESA during the SMOS extended phase A, as well as by national agencies, and also during the preparation of the similar Aquarius proposal to NASA, allowed progress in many aspects. The international scientific community, through the meetings of the Salinity and Sea Ice Working Group in the US and the yearly SMOS Workshops in Europe, has analysed and discussed these results and

highlighted the issues still to be addressed and solved. Some of them are related to the general process of inverting radiometric data under the influence of environmental parameters, and others refer to specific instrumental or data processing aspects for the SMOS configuration case. Specific key questions are the precise determination of sea water permittivity through laboratory experiments; the improvement of existing sea surface emissivity models with the many corrections due to sea state conditions (surface roughness, presence of foam, effects of rain, etc.); the need to establish a complete SMOS sea surface salinity error budget from instrumental and geophysical constraints; the development of efficient salinity retrieval algorithms; and the set-up of an operational post- launch calibration/validation strategy. In this paper we describe the main results from recent studies and campaigns and update the present situation on issues still to be solved.
Author
Soil Moisture; Earth Observations (From Space); Salinity; Oceanographic Parameters; Ocean Models

20030056709 California Univ., Los Angeles, CA, USA
Complexity, Forced and/or Self-Organized Criticality, and Topological Phase Transitions in Geospace Plasmas
Chang, Tom; Tam, Sunny W. Y.; Wu, Cheng-Chin; Consolini, Giuseppe; [2002]; 19 pp.; In English
Contract(s)/Grant(s): NAG5-9111; Copyright; Avail: Other Sources

The first definitive observation that provided convincing evidence indicating certain turbulent space plasma processes are in states of complexity was the discovery of the apparent power-law probability distribution of solar flare intensities. Recent statistical studies of complexity in space plasmas came from the AE index, UVI auroral imagery, and in-situ measurements related to the dynamics of the plasma sheet in the Earth's magnetotail and the auroral zone. In this review, we describe a theory of dynamical complexity for space plasma systems far from equilibrium. We demonstrate that the sporadic and localized interactions of magnetic coherent structures are the origin of complexity in space plasmas. Such interactions generate the anomalous diffusion, transport, acceleration, and evolution of the macroscopic states of the overall dynamical systems. Several illustrative examples an: considered. These include: the dynamical multi- and cross-scale interactions of the macro- and kinetic coherent structures in a sheared magnetic field geometry, the preferential acceleration of the bursty bulk flows in the plasma sheet, the onset of fluctuation induced nonlinear instabilities that can lead to magnetic reconfigurations. The technique of dynamical renormalization-group is introduced and applied to the study of two-dimensional nonresonant intermittent MHD fluctuations and an anomalous modified forest-fire model exhibiting forced and/or self-organized criticality [FSOC] and other types of topological phase transitions.
Author
Phase Transformations; Space Plasmas; Dynamical Systems; Geomagnetic Tail; Plasma Interactions; Magnetic Islands; Current Sheets; Renormalization Group Methods

20030056710 Hokkaido Univ., Sapporo, Japan
Geophysical Bulletin of Hokkaido University, No. 66
Koyama, Junji, Editor; Hariyama, Toshio, Editor; Hayashi, Yoshiyuki, Editor; Ikeda, Ryuji, Editor; Kasahara, Minoru, Editor; Nishida, Yasunori, Editor; Okada, Hiromu, Editor; Shimamura, Hideki, Editor; Watanabe, Shigeto, Editor; Yomogida, Kiyoshi, Editor; March 2003; ISSN 0439-3503; 104 pp.; In Japanese; In English; See also 20030056711 - 20030056717; Original contains black and white illustrations; Copyright; Avail: Other Sources

This journal issue contains several articles that pertain to seismic activity in and around Japan, a seismic survey of the Mizuho plateau in East Antarctica, mapping gravity anomalies in the Ishikari plain of Japan related to differing topography and geologic faults, and the use of polarization lidar to study growth processes and the microphysical structure of jet contrails in the atmosphere.
CASI
Japan; Seismology; Gravity Anomalies; Cloud Physics; Contrails; Seismic Waves

20030056711 Hokkaido Univ., Sapporo, Japan
Seismic Observation in the Source Region of the 1952 Tokachi-Oki Earthquake by Ocean Bottom Seismographs: Preliminary Report
Takanami, Tetsuo; Murai, Yoshio; Honda, Ryou; Nishimura, Yuichi; Katsumata, Kei; Shimamura, Hideki; Hasegawa, Seizo; Uki, Nagahisa; Geophysical Bulletin of Hokkaido University; March 2003, No. 66, pp. 63-75; In Japanese; See also 20030056710; Original contains black and white illustrations; Copyright; Avail: Other Sources

We have deployed 10 OBSs (Ocean Bottom Seismographs) in the source region of the 1952 Tokachi-Oki earthquake (M 8.2) off Hokkaido Island in the period from 20 July to 20 September, 2002. The observation area is located about 50-100 km

landward of the southern Kuril trench where the Pacific Plate is subducted toward Hokkaido Island. The present seismic activity in this area is extremely low in contrast with the adjacent trench areas. This observation is planned to investigate the current seismic activity in the source region of the 1952 Tokachi-Oki earthquake. In near future, we will report the locations of microearthquakes in the observation area.
Author
Earthquakes; Ocean Bottom; Seismographs; Seismology

20030056712 Hokkaido Univ., Sapporo, Japan
Seismic Survey on the Mizuho Plateau in the SEAL Project, JARE-43 (2002), East Antarctica
Takada, Masamitsu; Toda, Shigeru; Kamiya, Daisuke; Miyamichi, Hiroki; Geophysical Bulletin of Hokkaido University; March 2003, No. 66, pp. 77-85; In Japanese; See also 20030056710; Original contains black and white illustrations; Copyright; Avail: Other Sources

Seismic survey with 8 dynamite shots was conducted on the Mizuho Plateau in JARE-43 (2002), East Antarctica. Along the survey line of about 150 km, 161 seismic observations were installed. The seismic survey consists of 3 groups, engaged in controlled source, seismic observation and helicopter operations. Our group mainly worked for the seismic instrumentation and observation in addition to the radio echo sounding survey to detect the icebed thickness. This report introduces the outline of our survey.
Author
Antarctic Regions; Echo Sounding; Radio Echoes; Explosions; Seismic Waves

20030056713 Hokkaido Univ., Sapporo, Japan
Explosion Seismic Observation in Sapporo, Japan
Yoshida, Kunikazu; Sasatani, Tsutomu; Geophysical Bulletin of Hokkaido University; March 2003, No. 66, pp. 1-9; In Japanese; See also 20030056710; Original contains black and white illustrations; Copyright; Avail: Other Sources

A seismic refraction experiment was carried out in Sapporo by the municipality. The experiment aimed to investigate the basin structure. The experiment area can be divided into two areas, a deep sedimentary basin in the western part of the Ishikari depression where the urban area of Sapporo locates and mountains in the southwestern part of the city. Two explosive sources with a charge size of 50 kg were fired on 28 November 2002 ; one (SP-1) was fired at the southern mountain and the other (SP-2), at the junction of the Ishikari and the Toyohira River. The profile with a length of about 20 km ran along the Toyohira River. In this paper, we show a preliminary result of the seismic observation for the two explosive sources along an additional profile. Our profile with a length of about 20 km runs in the SW direction from the SP-2 toward the mountains, crossing Higashi-ku, Kita-ku and Nishi-ku of Sapporo. Seismic data were observed at forty-four temporal stations. The apparent velocities of first arrivals for the SP-2 shot change with distance. The apparent velocity for the distance range of I to 5 km is about 2.3 km/s, indicating P-wave velocity of upper sedimentary layers. The apparent velocity of 3.7 km/s for the distance range of 6 to 11 km indicates P-wave velocity of lower sedimentary layers. The apparent velocity of 6.2 km/s for the distance range of 11 to 14 km suggests the basement P-wave velocity. The apparent velocity for the distance range of 14 to 20 km is abnormally high, about 10 km/s. This fact indicates that the basement becomes shallow toward the mountains. Seismic signals from the SP-1 shot are weak, but the apparent velocity for the mountain area is about 5.5 km/s.
Author
Japan; Explosions; Seismic Waves; Structural Basins; Wave Propagation; Propagation Velocity

20030056715 Hokkaido Univ., Sapporo, Japan
Gravity Anomaly Atlas of the Ishikari Plain and Its Vicinity, Hokkaido, Japan
Yamamoto, Akihiko; Geophysical Bulletin of Hokkaido University; March 2003, No. 66, pp. 33-62; In Japanese; See also 20030056710; Original contains black and white illustrations; Copyright; Avail: Other Sources

The Ishikari Plain in western Hokkaido, Japan, is characterized by the largest alluvial lowland (the Ishikari Lowland) in Hokkaido. Neogene rugged mountains dominate western part of the plain, and in the eastern margin of this plain lies the Ishikari Teichi Touen Fault Zone (ITTFZ) which borders on the Miocene hill belts Uwamizawa, Kurisawa and Umaoi hills). To the east of the hill belts spread Yubari Mountains and the Yubari Coal area mainly composed of pre-Neogene volcanic rocks. The ITTFZ runs in a nearly N-S direction, protruding westward, and is classified as reverse fault system. Recent study of active faults in Japan has led to a new fault mapping in which activity classification and location of faults are accurately re-determined. While no noteworthy faults have been observed near Sapporo city, the Nopporo Hill Fault Zone is newly identified as an active fault system in the newly-compiled fault mapping. Although Bouguer anomalies around the Ishikari

Plain are known to be characterized by (1) low anomalies corresponding to Quaternary sediments in the plain, and (2) high anomalies corresponding to Neogene high-density rocks, detailed gravity structure particularly across the ITTFZ in the eastern margin of the plain has not been reported so far. We performed gravity surveys and compiled pre-existed gravity data in and around the Ishikari Plain to reveal a fine structure around the plain. Finally, a new gravity anomaly atlas (Bouguer anomaly map and a first horizontal derivative/gradient map) of the Ishikari Plain and its vicinity was produced on the basis of these gravity data. A new Bouguer anomaly map delineates an excellent correlation between tectonic boundaries or known faults and Bouguer anomaly distributions. Also the map shows that the Ishikari Plain is characterized by a predominant gravity low with the amplitude of the order of 10~20 mgal with several gravity highs corresponding to Quaternary uplift zone. This gravity low is strongly correlated to the surface geology and topography. In mountainous area west of the plain high gravity anomaly is dominant over the Neogene volcanic rocks. Pronounced local gravity high with several closed maxima can be observed in the western margin of the Miocene hill belts, conforming to the trend of the geological formations in the area. We conclude that this local high anomaly along the ITTFZ has a high horizontal gradient value of more than 10 mgal/km amplitude, and is attributable to active fault dynamics forming the ITTFZ.
Author
Gravity Anomalies; Mapping; Earth Gravitation; Japan

20030056716 Hokkaido Univ., Sapporo, Japan
An Unusual Seismic Activity from October, 2001 to June, 2002, off Tokachi, Hokkaido, Japan
Ichiyanagi, Masayoshi; Takahashi, Hiroaki; Motoya, Yoshinobu; Kasahara, Minoru; Mikada, Hitoshi; Hirata, Kenji; Suyehiro, Kiyoshi; Geophysical Bulletin of Hokkaido University; March 2003, No. 66, pp. 87-99; In Japanese; See also 20030056710; Original contains black and white illustrations; Copyright; Avail: Other Sources

A remarkable sequence of earthquakes occurred from October, 2001 to June, 2002, off Tokachi, in the southwestern part of Kuril trench. The region of this seismic activity was adjacent to the southern rim of the focal region of the 1952 Tokachi-oki Earthquake of M 8.2. We revealed characteristics of this earthquake sequence in relation to the 1952 large event. Three ocean bottom seismographs have been deployed off Tokachi by JAMSTEC and one of them was just above the focal region of this activity. Using data from seismometers in land as well as on the sea floor, we redetermined hypocenters by the double-difference method which is suitable for detecting earthquake clusters in a small area. This seismic activity was composed of three active stages, period I from 27th to the end of October, 2001, with maximum event of M 4.7. period II from 22nd to the end of November, 2001, with M 4.9 and period III from 12th to the end of May, 2002, with M 4.6. Hypocenters in the three stages do not overlap one another. Earthquakes of this sequence occurred on the plate boundary between the Pacific and overriding plates. While earthquakes larger than M 3.0 had occurred nearly constantly in the focal region of the 1952 Tokachi-oki Earthquake from 1955 to 1990, no event has occurred in the next decade until this seismic activity starts on October 27, 2001. This suggests that the coupling state between the Pacific and the overriding plates may change recently, though major events in the sequence were not over M 5 and their focal mechanisms were not the typical low angle thrust faults along the plate boundary.
Author
Earthquakes; Geological Faults; Ocean Bottom; Seismographs; Plates (Tectonics)

20030056717 Hokkaido Univ., Sapporo, Japan
Microgravity Survey in and Around Active Volcanoes in Hokkaido, Japan: Mt. Komaga-take
Oshima, Hiromitsu; Maekawa, Tokumitsu; Ueki, Sadato; Takeda, Yoshihito; Geophysical Bulletin of Hokkaido University; March 2003, No. 66, pp. 101-110; In Japanese; See also 20030056710; Original contains black and white illustrations; Copyright; Avail: Other Sources

We carried out microgravity survey around Mt. Komaga-take by means of four gravity meters in June 2002 for studying magmatic processes in long non-eruptive stage. The gravity change between June 1996 and June 2002 is negative, and the amounts trend to increase toward the summit of Komaga-take. The gravity changes were reproduced by the inflation source at the depth of 3.8 km below sea level under the 1929 crater. The depth roughly corresponds to the bottom of the hypocentral region below the crater. The rate of magma intrusion is also estimated to be 3.9 x 10(exp 9)kg/yr. The rate accumulates the same amount of magma as the mass of pyroclastic deposits ejected by the 1929 eruption when the magma is continuously supplied to the pressure source at the estimated rate from the end of the 1929 eruption.
Author
Gravitation; Magma; Microgravity; Volcanoes

20030056723 California Univ., Los Angeles, CA, USA

Further Study of the Dynamics of Two-Dimensional MHD Coherent Structures: A Large-Scale Simulation

Wu, Cheng-Chin; Chang, Tom; Journal of Atmospheric and Solar-Terrestrial Physics; [2001]; ISSN 1364-6826; Volume 63, pp. 1447-1453; In English

Contract(s)/Grant(s): NAG5-9111; Copyright; Avail: Other Sources

We report new large-scale two-dimensional MHD simulations regarding the random onset and interactions of localized coherent structures as well as the long-range behavior of such stochastic systems. With a magnetic shear, multiple coherent structures are formed and aligned with the imposed current sheet due to fluctuation-induced nonlinear instabilities. These results exhibit certain aspects of the intermittent turbulence model of sporadic localized reconnections for the Earth's magnetotail.

Author

Two Dimensional Models; Computerized Simulation; Geomagnetism; Coherent Radiation; Magnetohydrodynamic Turbulence

20030056725 Massachusetts Inst. of Tech., Cambridge, MA, USA

Preferential Acceleration of Coherent Magnetic Structures and Bursty Bulk Flows in Earth's Magnetotail

Chang, Tom; Wu, Cheng-Chin; Angelopoulos, Vassilis; Physica Scripta; 2002; Volume T98, pp. 48-51; In English

Contract(s)/Grant(s): NAG5-9111; NAG5-9626; Copyright; Avail: Other Sources

Observations indicate that the magnetotail convection is turbulent and bi-modal, consisting of fast bursty bulk flows (BBF) and a nearly stagnant background. We demonstrate that this observed phenomenon may be under stood in terms of the intermittent interactions, dynamic mergings and preferential accelerations of coherent magnetic structures under the influence of a background magnetic field geometry that is consistent with the development of an X-point mean-field structure.

Author

Geomagnetic Tail; Acceleration (Physics); Mathematical Models; Geophysics; Topology; Magnetohydrodynamics

20030057127 Utah State Univ., Logan, UT, USA

Visualization of Space-Time Ambiguities to be Explored by NASA GEC Mission with a Critique of Synthesized Measurements for Different GEC Mission Scenarios

Sojka, Jan J.; June 13, 2003; 17 pp.; In English

Contract(s)/Grant(s): NAG5-12117; No Copyright; Avail: CASI; A03, Hardcopy

The Grant supported research addressing the question of how the NASA Solar Terrestrial Probes (STP) Mission called Geospace electrodynamics Connections (GEC) will resolve space-time structures as well as collect sufficient information to solve the coupled thermosphere-ionosphere- magnetosphere dynamics and electrodynamics. The approach adopted was to develop a high resolution in both space and time model of the ionosphere-thermosphere (I-T) over altitudes relevant to GEC, especially the deep-dipping phase. This I-T model was driven by a high- resolution model of magnetospheric-ionospheric (M-I) coupling electrodynamics. Such a model contains all the key parameters to be measured by GEC instrumentation, which in turn are the required parameters to resolve present-day problems in describing the energy and momentum coupling between the ionosphere-magnetosphere and ionosphere-thermosphere. This model database has been successfully created for one geophysical condition; winter, solar maximum with disturbed geophysical conditions, specifically a substorm. Using this data set, visualizations (movies) were created to contrast dynamics of the different measurable parameters. Specifically, the rapidly varying magnetospheric E and auroral electron precipitation versus the slower varying ionospheric F-region electron density, but rapidly responding E-region density.

Author

Scientific Visualization; Solar Activity Effects; Solar Terrestrial Interactions; Magnetosphere-Ionosphere Coupling; Electrodynamics; Earth Ionosphere; Earth Magnetosphere; Thermosphere

20030057150 California Univ., Los Angeles, CA, USA

Turbulent Simulation of the Dynamics of the Magnetotail

Wu, Cheng-Chin; [2003]; 3 pp.; In English

Contract(s)/Grant(s): NAG5-9111; No Copyright; Avail: CASI; A01, Hardcopy

In situ observations indicate that the dynamical processes in the geoplasma environment generally entail localized intermittent processes and anomalous global transports. It was suggested by T. Chang that instead of considering the turbulence as a mixture of interacting waves, such type of patchy intermittency could be more easily understood in terms of the development, interaction, merging, preferential acceleration and evolution of coherent magnetic structures. In this

three-year project, we have used direct numerical MHD simulations to study some aspects of the MHD dynamics in Chang's model. Our large-scale numerical calculations and simulations have been supplemented by and coordinated with theoretical studies conducted by Chang and his colleagues.
Author
Geomagnetic Tail; Turbulence Models; Magnetohydrodynamic Turbulence; Direct Numerical Simulation

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20030055642 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Jet Stream Maintenance Over South America
deSouzaCruz, Gilsania; 2003; 102 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-9656-TDI/849; Copyright; Avail: CASI; C01, CDROM; A06, Hardcopy

Two methods were used to explain the maintenance of the jet stream over South America on the winter season. The first one is based in the analysis of the total Kinetic energy budget through the transversal circulation around the jet stream by the ageostrophic wind. The jet stream for El Nino and La Nina events, and years without the presence of these two events may be localy mantained by the budget between the kinetic energy generated by the ageostrophic flow and the energy of flux divergence. The transversal direct and indirect circulations are responsible for the conversion of available potential energy into kinetic in the entrance regions of the jet stream, and for the conversion of kinetic energy into potencial in the exit regions of the jet stream. The study of those circulations may evidence areas of divergence-convergence both in the high and low troposphere. The patterns, depending on the available energy, may generate instabilities which may favor the ocurrence and maintenance of mesoscale convective systems. In the second method the maintenance of the jet stream is studied through the definition of kinetic energy of the basic state and eddies. During El Nino events the jet stream intensity is kept by a conversion of turbulent available potential energy into turbulent kinetic energy (Pe Ke) through vertical movements followed by a conversion of kinetic turbulent energy into kinetic energy of the basic state (Ke Km), and a conversion of kinetic energy of the basic state into potential energy of the basic state (Km Pm), owing to forced movements. During La Nina events the jet stream looses kinetic energy of the basic state to the forced movements (Km Pm) and to the baroclinic disturbances (Km Ke), preceeded by a conversion of turbulent potential energy into turbulent kinetic energy (Pe Ke) through vertical movements, thus weakening the jet stream.
Author
Atmospheric Circulation; Atmospheric Energy Sources; Energy Budgets; Jet Streams (Meteorology); Climatology; South America; Kinetic Energy; Potential Energy

20030056592 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
An Analysis of the Surface Wind Field Over Tropical and South Atlantic Ocean Using ERS Scatterometer Data
Baptista, Marlos Carneiro; 2003; 131 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-9607-TDI/840; Copyright; Avail: CASI; C01, CDROM; A07, Hardcopy

Monthly mean and standard deviation values of surface winds of the Atlantic Ocean sector from 20 deg N to 40 deg S were generated from the ERS 1/2 scatterometer data. The data was obtained from IFREMER and covers the period from December 1991 to November 1998. The objective of this effort was the analysis of the spatial and temporal variability of the wind field for the region. The original data (wind direction and speed) were first converted into zonal and meridional components. Three day blocks of scatterometer data were used for the interpolation into a regular 1 deg x 1 deg geographic grid.. A simple spatial interpolation that uses an iteration procedure with a correction of mean value of weighted errors was implemented. An evaluation of this algorithm was done comparing the interpolated results with winds measured by the buoys of the PIRATA project array and the wind data from the NCEP reanalysis. The rms differences of buoy-scatterometer (P-S) and buoy-NCEP (P-N) wind magnitudes for 1998 were: 0;35W (PS= 1.13 ms(exp -1); P-N=1.11 ms(exp -1)); 10S;10W (P-S=0.72 ms(exp -1); P-N=1.83 ms(exp -1)) and 15N;38W (P-S=0.99 ms(exp -1)). The resulting wind fields describe the main features of Southeast and Northeast trades, with the ITCZ and semi-permanent high pressure system in the subtropics clearly detected. A meridional and seasonal migration of the center of the wind divergence in the South Equatorial Current region was observed in the scatterometer data. This could imply in a seasonal migration of the Brazil Current formation region.

The annual harmonic is the strongest signal present in the wind data in the tropics; the regions with highest annual harmonic are associated with the maximum seasonal meridional migration of the ITCZ.
Author
Wind Profiles; Atmospheric Circulation; Air Currents; Air Water Interactions; Atlantic Ocean; Tropical Regions; Statistical Analysis

20030056705 Meteorological Satellite Center, Kiyose, Japan
Monthly Report of the Meteorological Satellite Center: February 2003
February 2003; In English; In Japanese; Document files and Satellite data are recorded in either ASCII or shift JIS code; Full Disk Earth's Cloud Images are recorded in Bit-Map (BMP) format; Copyright; Avail: Other Sources

This CD-ROM concerns the February 2003 Monthly Report of the Meteorological Satellite Center (MSC). It contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the polar orbital meteorological satellites operated by NOAA (National Oceanographic and Atmospheric Administration). The CD-ROM contains the following observation data: Full Disk Earth's Cloud, Cloud Image of Japan and its Vicinity, Cloud Amount, Sea Surface Temperature, Cloud Motion Wind, Water Vapor Motion Wind, Equivalent Blackbody Temperature, OLR (Out-going Longwave Radiation), Solar Irradiation, Snow and Ice Index, Orbit Data, Attitude Data, VISSR (Visible Infrared Spin Scan Radiometer) Image Data Catalog, (Cartridge Magnetic Tape (CMT), Micro Film), TOVS (TIROS (Television and Infrared Observation Satellite) Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water, TOVS Total Ozone Amount. Although this user's guide is revised yearly, it may happen that a change of contents of the Monthly Report is not reflected in the user's guide, if the change is carried out between revisions of the user's guide. The latest contents of the Monthly Report and the detailed information of the contents are described in document files which are contained in the CD-ROM. Please read the document files.
Derived from text
Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

20030056714 Hokkaido Univ., Sapporo, Japan
Contrail Observations by Polarization Lidar
Harimaya, Toshio; Honma, Akira; Kajikawa, Masahiro; Geophysical Bulletin of Hokkaido University; March 2003, No. 66, pp. 11-31; In Japanese; See also 20030056710; Original contains black and white illustrations; Copyright; Avail: Other Sources

Observations by polarization lidar were performed at Akita University in Akita City in order to study the growth process and microphysical structure of the contrail. Four observations at higher altitude were above the Appleman (1913) threshold for contrail formation. Ten observations at lower altitude were below the Appleman threshold and confirmed to form at temperatures of a few degrees above the threshold for contrail formation. These results agree with a previous report (Kajikawa, 1996). The scattering ratio values of the contrail became smaller toward the outside with the maximum value in the center of the contrail. Therefore, the contrail is thought to mix with the surrounding air and diffuse outward. The depolarization ratio values became nearly zero at the center of the contrail and larger toward the outside of the contrail. Ice particles in the center of the contrail where the concentration of ice particles is high grow slowly and maintain the initial shape of frozen drop, whereas ice particles in the outside of the contrail where the concentration of ice particles is low grow quickly and become aspherical. The vertical section of the contrail showed the shape which descends from a tip to a tail. From this fact, it is considered that ice particles of the contrail is falling, so the contrail is extended horizontally. The width of the contrail increased linearly with wind shear. Therefore, the width of the contrail is considered to be dependent on wind shear.
Author
Contrails; Crystal Growth; Ice Clouds; Ice Nuclei; Cloud Physics

20030057216 Lawrence Livermore National Lab., Livermore, CA
Potential Predictability of Seasonal Land-Surface Climate
Phillips, T. J.; Oct. 01, 2001; In English
Report No.(s): DE2003-15002740; UCRL-ID-145701; No Copyright; Avail: National Technical Information Service (NTIS)

The chaotic behavior of the continental climate of an atmospheric general circulation model is investigated from an ensemble of decadal simulations with common specifations of radiative forcings and monthly ocean boundary conditions, but different initial states of atmosphere and land. The variability structures of key model land-surface processes appear to agree sufficiently with observational estimates to warrant detailed examination of their predictability on seasonal time scales. This

predictability is inferred from several novel measures of spatio-temporal reproducibility applied to eleven model variables. The reproducibility statistics are computed for variables in which the seasonal cycle is included or excluded, the former case being most pertinent to climate model simulations, and the latter to predictions of the seasonal anomalies. Because the reproducibility metrics in the latter case are determined in the context of a perfectly known ocean state, they are properly viewed as estimates of the potential predictability of seasonal climate. Inferences based on these reproducibility metrics are shown to be in general agreement with those derived from more conventional measures of potential predictability.
NTIS
Weather Forecasting; Climatology

20030057244 Lawrence Livermore National Lab., Livermore, CA
Evaluation of Boundary Conditions for Modeling Urban Boundary Layers
Stevens, D. E.; Calhoun, R. J.; Chan, S. T.; Lee, R. L.; May 18, 2000; 8 pp.; In English
Report No.(s): DE2003-792807; UCRL-JC-137626; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Boundary Layers; Boundary Conditions

20030057278 Arizona Univ., Tucson, AZ, USA
Land Processes in a High Resolution Community Climate Model with Sub-Grid Scale Parameterizations
Hahmann, A. N.; Dickinson, R. E.; Jul. 21, 2002; 24 pp.; In English
Report No.(s): DE2003-797450; No Copyright; Avail: Department of Energy Information Bridge
The characteristics of land important for climate are very heterogeneous, as are the key atmospheric inputs to land, i.e. precipitation and radiation. To adequately represent this heterogeneity, state-of-the-art climate models should represent atmospheric inputs to land, land properties, and the dynamical changes of land at the highest resolution accessible by climate models. The research funded under this project focused on the development of an alternative approach to this problem in which a sub-mesh is imposed on each atmospheric model grid square. This allows representation of the land climate dynamics at a higher resolution than that achievable in the global atmospheric models. The high spatial detail of the fine-mesh treatment provides not only a more accurate representation of land processes to the atmospheric model, but also the opportunity for direct downscaling of the surface climate.
NTIS
Atmospheric Models; Climate Models; Heterogeneity

48
OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20030055682 NASA Goddard Space Flight Center, Greenbelt, MD, USA
L-band Dielectric Constant Measurements of Seawater (Oral presentation and SMOS Poster)
Lang, Roger H.; Utku, Cuneyt; LeVine, David M.; [2003]; 1 pp.; In English; IGARSS Conference, 21-25 Jul. 2003, Toulouse, France; Copyright; Avail: Other Sources; Abstract Only
This paper describes a resonant cavity technique for the measurement of the dielectric constant of seawater as a function of its salinity. Accurate relationships between salinity and dielectric constant (which determines emissivity) are needed for sensor systems such as SMOS and Aquarius that will monitor salinity from space in the near future. The purpose of the new measurements is to establish the dependence of the dielectric constant of seawater on salinity in contemporary units (e.g. psu) and to take advantage of modern instrumentation to increase the accuracy of these measurements. The measurement device is a brass cylindrical cavity 16cm in diameter and 7cm in height. The seawater is introduced into the cavity through a slender glass tube having an inner diameter of 0.1 mm. By assuming that this small amount of seawater slightly perturbs the internal fields in the cavity, perturbation theory can be employed. A simple formula results relating the real part of the dielectric constant to the change in resonant frequency of the cavity. In a similar manner, the imaginary part of the dielectric constant is related to the change in the cavity s Q. The expected accuracy of the cavity technique is better than 1\% for the real part and 1 to 2\% for the imaginary part. Presently, measurements of methanol have been made and agree with precision measurements in the literature to within 1\% in both real and imaginary parts. Measurements have been made of the dielectric

constant of seawater samples from Ocean Scientific in the UK with salinities of 10, 30, 35 and 38 psu. All measurements were made at room temperature. Plans to make measurements at a range of temperatures and salinities will be discussed.
Author
Sea Water; Emissivity; Resonant Frequencies; Perturbation Theory

20030056665 NASA Goddard Space Flight Center, Greenbelt, MD, USA
30-Year Satellite Record Reveals Accelerated Arctic Sea Ice Loss, Antarctic Sea Ice Trend Reversal
Cavalieri, Donald J.; Parkinson, C. L.; Vinnikov, K. Y.; [2003]; 3 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

Arctic sea ice extent decreased by 0.30 plus or minus 0.03 x 10(exp 6) square kilometers per decade from 1972 through 2002, but decreased by 0.36 plus or minus 0.05 x 10(exp 6) square kilometers per decade from 1979 through 2002, indicating an acceleration of 20\% in the rate of decrease. In contrast to the Arctic, the Antarctic sea ice extent decreased dramatically over the period 1973-1977, then gradually increased, with an overall 30-year trend of -0.15 plus or minus 0.08 x 10(exp 6) square kilometers per 10yr. The trend reversal is attributed to a large positive anomaly in Antarctic sea ice extent observed in the early 1970's.
Author
Antarctic Regions; Arctic Ocean; Sea Ice; Oceanography; Polar Regions

20030057104 Oregon State Univ., Corvallis, OR, USA
Spatial Variation of Surface Moisture Fluxes in SGP
Mahrt, L.; Vickers, Dean; June 11, 2003; 7 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-8601
Report No.(s): NS094A; No Copyright; Avail: CASI; A02, Hardcopy

Analysis of aircraft data in 'spatial variations of surface moisture flux from aircraft data' indicates that the impact of small-scale surface heterogeneity on the spatial variation of surface moisture fluxes into the atmosphere is reduced by horizontal mixing. This mixing generally increases with the development of the daytime convective mixed layer, thus reducing the relative influence of surface heterogeneity on the spatial variation of moisture fluxes.
Author
Spatial Distribution; Heterogeneity; Atmospheric Moisture; Heat Flux; Hydrology

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20030056677 Purdue Univ., West Lafayette, IN, USA
A Gravity-Responsive Time-Keeping Protein of the Plant and Animal Cell Surface
Morre, D. James; [2003]; 22 pp.; In English
Contract(s)/Grant(s): NAG2-1344; No Copyright; Avail: CASI; A03, Hardcopy

The hypothesis under investigation was that a ubiquinol (NADH) oxidase protein of the cell surface with protein disulfide-thiol interchange activity (= NOX protein) is a plant and animal time-keeping ultradian (period of less than 24 h) driver of both cell enlargement and the biological clock that responds to gravity. Despite considerable work in a large number of laboratories spanning several decades, this is, to my knowledge, our work is the first demonstration of a time-keeping biochemical reaction that is both gravity-responsive and growth-related and that has been shown to determine circadian periodicity. As such, the NOX protein may represent both the long-sought biological gravity receptor and the core oscillator of the cellular biological clock. Completed studies have resulted in 12 publications and two issued NASA-owned patents of the clock activity. The gravity response and autoentrainment were characterized in cultured mammalian cells and in two plant systems together with entrainment by light and small molecules (melatonin). The molecular basis of the oscillatory behavior was investigated using spectroscopic methods (Fourier transform infrared and circular dichroism) and high resolution electron

microscopy. We have also applied these findings to an understanding of the response to hypergravity. Statistical methods for analysis of time series phenomena were developed (Foster et al., 2003).
Derived from text
Proteins; Plants (Botany); Biochemistry; Gravitation; Cells (Biology); Chemical Reactions; Time Series Analysis

20030057211 National Defence Research Establishment, Linkoeping, Sweden
Vestibular Mechanisms of Spatial Disorientation
Tribukait, A.; Eiken, O.; Dec. 2001; 42 pp.; In Swedish
Report No.(s): PB2003-103201; FOI-R-0270-SE; No Copyright; Avail: CASI; A03, Hardcopy

Measurements of the subjective visual horizontal (SVH) and the subjective visual eye level (SVEL) were made in a large swing-out gondola centrifuge. Rotation of the centrifuge was anti-clockwise, as seen from above. Test subjects were seated upright in the gondola, facing forwards. In front of the subject there was either a luminous line, which could be rotated about the visual axis, or a laser dot, which could be moved up or down. Thirteen normal subjects were asked to indicate, by adjusting the line or dot, what they perceived as horizontal in roll (SVH) and pitch (SVEL). Measurements were made in 1 g environment and during 10 min at 2G. Initially after acceleration of the centrifuge the SVH was tilted relative to the gravitoinertial horizontal. The direction of this tilt was dependent on the subject's strategy for spatial orientation, which could be either allocentric (referring to the surroundings) or egocentric (referring to the co-ordinate system of the own body). The interindividual variability of the initial SVH-tilt was large, ranging from a few degrees to more than 40 degrees. The magnitude of tilt was larger for the allocentric strategy (mean 19 degrees) than for egocentric strategy (10 degrees). The time constant for exponential decay was 2-3 min. At 2G the SVEL was lower than in 1 g environment. The deviation from the gravitoinertial eye level gradually increased, approaching an asymptotic maximum with a time constant of 2-3 min. The asymptote was dependent on the strategy of the subject; the mean values were 25 degrees (allocentric strategy) and 13 degrees (egocentric strategy). In conclusion, the normal subjects showed a large interindividual variability, which may be related to several factors, such as mental strategy, relative dependency on otolith versus semicircular canal information on changes in head orientation, and the memory for semicircular canal information on changes in static head position. The results are viewed in the context of spatial disorientation.
NTIS
Vestibules; Disorientation; Eye (Anatomy); Otolith Organs; Semicircular Canals

20030057221 Colorado Univ., Boulder, CO, USA, National Jewish Medical and Research Center, Denver, CO, USA
Efficacy of Ultraviolet Irradiation in Controlling the Spread of Tuberculosis, October 14, 2002
Miller, S. L.; Hernandez, M.; Fennelly, K.; Martyny, J.; Macher, J.; Oct. 14, 2002; 96 pp.; In English
Report No.(s): PB2003-103816; No Copyright; Avail: CASI; A05, Hardcopy

The efficacy of killing or inactivating airborne bacteria using upper-room air UVGI from a modern UVGI system was investigated in realistic physical scenarios under carefully controlled laboratory conditions. The research objectives pursued in this project are detailed: (1) Establishment of a full-scale test room that simulated a typical health-care facility isolation room with a modern UVGI system; (2) Characterize the irradiance provided to the test room by the UVGI system; (3) Estimate the effectiveness of UVGI for three microorganisms (Mycobacterium parafortuitum, Bacillus subtilis spores, and Mycobacterium bovis BCG) for two room ventilation rates, 0 and 6 air changes per hour; Measure the inactivation rate as a function of UVGI and calculate the Z value due to UVGI for M. parafortiuitum; (5) Evaluate the impact of varying relative humidity on the UVGI effectiveness and inactivation rate; (6) Quantify how different levels, and spatial distributions, of UVGI, impact the inactivation rate; (7) Determine whether photoreactivation is a concern for real applications of UVGI; (8) Establish whether the air mixing in a room will change the performance of a UVGI system.
NTIS
Irradiation; Tuberculosis; Ultraviolet Radiation; Airborne Infection

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20030057125 Salk Inst., La Jolla, CA, USA
Investigation of Neural Strategies of Visual Search
Krauzlis, Richard J.; [2003]; 5 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC2-5432; No Copyright; Avail: CASI; A01, Hardcopy

The goal of this project was to measure how neurons in the superior colliculus (SC) change their activity during a visual search task. Specifically, we proposed to measure how the activity of these neurons was altered by the discriminability of visual targets and to test how these changes might predict the changes in the subjects performance. The primary rationale for this study was that understanding how the information encoded by these neurons constrains overall search performance would foster the development of better models of human performance. Work performed during the period supported by this grant has achieved these aims. First, we have recorded from neurons in the superior colliculus (SC) during a visual search task in which the difficulty of the task and the performance of the subject was systematically varied. The results from these single-neuron physiology experiments shows that prior to eye movement onset, the difference in activity across the ensemble of neurons reaches a fixed threshold value, reflecting the operation of a winner-take-all mechanism. Second, we have developed a model of eye movement decisions based on the principle of winner-take-all . The model incorporates the idea that the overt saccade choice reflects only one of the multiple saccades prepared during visual discrimination, consistent with our physiological data. The value of the model is that, unlike previous models, it is able to account for both the latency and the percent correct of saccade choices.

Author

Eye Movements; Human Performance; Neurons; Visual Discrimination

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20030055666 NASA Ames Research Center, Moffett Field, CA, USA

Modeling of Depth Cue Integration in Manual Control Tasks

Sweet, Barbara T.; Kaiser, Mary K.; Davis, Wendy; May 2003; 92 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): RTOP 727-05-00

Report No.(s): NASA/TM-2003-211407; IH-026; NAS 1.15:211407; No Copyright; Avail: CASI; A05, Hardcopy

Psychophysical research has demonstrated that human observers utilize a variety of visual cues to form a perception of three-dimensional depth. However, most of these studies have utilized a passive judgement paradigm, and failed to consider depth-cue integration as a dynamic and task-specific process. In the current study, we developed and experimentally validated a model of manual control of depth that examines how two potential cues (stereo disparity and relative size) are utilized in both first- and second-order active depth control tasks. We found that stereo disparity plays the dominate role for determining depth position, while relative size dominates perception of depth velocity. Stereo disparity also plays a reduced role when made less salient (i.e., when viewing distance is increased). Manual control models predict that position information is sufficient for first-order control tasks, while velocity information is required to perform a second-order control task. Thus, the rules for depth-cue integration in active control tasks are dependent on both task demands and cue quality.

Author

Manual Control; Visual Stimuli; Space Perception; Psychophysics; Mathematical Models; Human Factors Engineering

20030056700 Massachusetts Inst. of Tech., Cambridge, MA, USA

Quantifying Astronaut Tasks: Robotic Technology and Future Space Suit Design

Newman, Dava; May 30, 2003; 53 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG9-1089; No Copyright; Avail: CASI; A04, Hardcopy

The primary aim of this research effort was to advance the current understanding of astronauts' capabilities and limitations in space-suited EVA by developing models of the constitutive and compatibility relations of a space suit, based on experimental data gained from human test subjects as well as a 12 degree-of-freedom human-sized robot, and utilizing these fundamental relations to estimate a human factors performance metric for space suited EVA work. The three specific objectives are to: 1) Compile a detailed database of torques required to bend the joints of a space suit, using realistic, multi- joint human motions. 2) Develop a mathematical model of the constitutive relations between space suit joint torques and joint angular positions, based on experimental data and compare other investigators' physics-based models to experimental data. 3) Estimate the work envelope of a space suited astronaut, using the constitutive and compatibility relations of the space suit. The body of work that makes up this report includes experimentation, empirical and physics-based modeling, and model applications. A detailed space suit joint torque-angle database was compiled with a novel experimental approach that used

space-suited human test subjects to generate realistic, multi-joint motions and an instrumented robot to measure the torques required to accomplish these motions in a space suit. Based on the experimental data, a mathematical model is developed to predict joint torque from the joint angle history. Two physics-based models of pressurized fabric cylinder bending are compared to experimental data, yielding design insights. The mathematical model is applied to EVA operations in an inverse kinematic analysis coupled to the space suit model to calculate the volume in which space-suited astronauts can work with their hands, demonstrating that operational human factors metrics can be predicted from fundamental space suit information. Derived from text

Human Factors Engineering; Extravehicular Activity; Space Suits; Astronauts; Robotics

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20030056646 DYNACS Engineering Co., Inc., Cocoa Beach, FL, USA

Binarization of Gray-Scaled Digital Images Via Fuzzy Reasoning

Dominquez, Jesus A.; Klinko, Steve; Voska, Ned, Technical Monitor; January 2002; 14 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS10-98001

Report No.(s): KSC-2002-122; No Copyright; Avail: CASI; A03, Hardcopy

A new fast-computational technique based on fuzzy entropy measure has been developed to find an optimal binary image threshold. In this method, the image pixel membership functions are dependent on the threshold value and reflect the distribution of pixel values in two classes; thus, this technique minimizes the classification error. This new method is compared with two of the best-known threshold selection techniques, Otsu and Huang-Wang. The performance of the proposed method supersedes the performance of Huang- Wang and Otsu methods when the image consists of textured background and poor printing quality. The three methods perform well but yield different binarization approaches if the background and foreground of the image have well-separated gray-level ranges.

Author

Fuzzy Systems; Image Processing; Mathematical Models; Gray Scale; Digital Systems

20030057183 Lawrence Livermore National Lab., Livermore, CA

Highly Stable Explicit Technique for Stiff Reaction-Transport PDEs

Aro, C. J.; Franz, A.; Slone, D.; Dec. 1996; 16 pp.; In English

Report No.(s): DE2003-16387; UCRL-JC-126371; No Copyright; Avail: Department of Energy Information Bridge

The numerical simulation of chemically reacting flows is a topic that has attracted a great deal of current research. At the heart of numerical reactive flow simulations are large sets of coupled, nonlinear partial differential equations (PDEs). Due to the stiffness that is usually present, explicit time differencing schemes are not used despite their inherent simplicity and efficiency on parallel and vector machines, since these schemes require prohibitively small numerical stepsizes. Implicit time differencing schemes, although possessing good stability characteristics, introduce a great deal of computational overhead necessary to solve the simultaneous algebraic system at each timestep. This paper proposes an algorithm based on a preconditioned time differencing scheme. The algorithm is explicit and permits a large stable time step. A study of the algorithm's performance on a parallel architecture is presented.

NTIS

Transport Theory; Partial Differential Equations

20030057204 Lawrence Livermore National Lab., Livermore, CA

Grid and Zone Selection for AMR and ALE Schemes

Jameson, L.; Johnson, J.; Bihari, B.; Eliason, D.; Peyser, T.; Sep. 11, 2002; 28 pp.; In English

Report No.(s): DE2003-15002527; UCRL-ID-147202-REV-1; No Copyright; Avail: Department of Energy Information Bridge

Numerical algorithms are based fundamentally on polynomial interpolation. In regions of the computational domain where a low order polynomial fits the data well one will find small errors in the computed quantities. Therefore, in order to design robust methods for grid selection for AMR schemes or zone selection for ALE schemes, one needs some information

on the local polynomial structure of the fields being computed. We provide here algorithms and software for selecting zones based on local estimates of polynomial interpolation error. The algorithms are based on multiresolution and wavelet analysis.
NTIS
Wavelet Analysis; Grid Generation (Mathematics)

20030057293 Lawrence Livermore National Lab., Livermore, CA
Arbitrary Order Hierarchical Bases for Computational Electromagnetics
Rieben, R. N.; White, D.; Rodrigue, G.; Dec. 20, 2002; In English
Report No.(s): DE2003-15002748; UCRL-JC-150240; No Copyright; Avail: Department of Energy Information Bridge

The authors present a clear and general method for constructing hierarchical vector bases of arbitrary polynomial degree for use in the finite element solution of Maxwells equations.
NTIS
Electromagnetism; Maxwell Equation

20030057294 Lawrence Livermore National Lab., Livermore, CA
Multigrid Methods for Nonlinear Problems: An Overview
Henson, V. E.; Dec. 23, 2002; 20 pp.; In English
Report No.(s): DE2003-15002749; UCRL-JC-150259; No Copyright; Avail: Department of Energy Information Bridge

Since their early application to elliptic partial differential equations, multigrid methods have been applied successfully to a large and growing class of problems, from elasticity and computational fluid dynamics to geodetics and molecular structures. Classical multigrid begins with a two-grid process. First, iterative relaxation is applied, whose object is to smooth the error. Then a coarse-grid correction is applied, in which the smooth error is determined on a coarser grid. This error is interpolated to the fine grid and used to correct the fine-grid approximation. Applying this method recursively to solve the coarse-grid problem leads to multigrid. The coarse-grid correction works because the residual equation is linear. But this is not the case for nonlinear problems, and different strategies must be employed. In this presentation the authors describe how to apply multigrid to nonlinear problems. There are two basic approaches. The first is to apply a linearization scheme, such as the Newton's method, and to employ multigrid for the solution of the Jacobian system in each iteration. The second is to apply multigrid directly to the nonlinear problem by employing the so called Full Approximation Scheme (FAS). In FAS a nonlinear iteration is applied to smooth the error. The full equation is solved on the coarse grid, after which the coarse-grid error is extracted from the solution. This correction is then interpolated and applied to the fine grid approximation. We describe these methods in detail, and present numerical experiments that indicate the efficacy of them.
NTIS
Multigrid Methods; Nonlinearity; Problem Solving

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20030020950 NASA Ames Research Center, Moffett Field, CA, USA
Scalability of a Low-Cost Multi-Teraflop Linux Cluster for High-End Classical Atomistic and Quantum Mechanical Simulations
Kikuchi, Hideaki; Kalia, Rajiv K.; Nakano, Aiichiro; Vashishta, Priya; Shimojo, Fuyuki; Saini, Subhash; [2003]; 8 pp.; In English; International Parallel and Distributed Computing Conference, 22-26 Apr. 2003, Nice, France; Original contains black and white illustrations; Copyright; Avail: CASI; A02, Hardcopy

Scalability of a low-cost, Intel Xeon-based, multi-Teraflop Linux cluster is tested for two high-end scientific applications: Classical atomistic simulation based on the molecular dynamics method and quantum mechanical calculation based on the density functional theory. These scalable parallel applications use space-time multiresolution algorithms and feature computational-space decomposition, wavelet-based adaptive load balancing, and spacefilling-curve-based data compression for scalable I/O. Comparative performance tests are performed on a 1,024-processor Linux cluster and a conventional higher-end parallel supercomputer, 1,184-processor IBM SP4. The results show that the performance of the Linux cluster is

comparable to that of the SP4. We also study various effects, such as the sharing of memory and L2 cache among processors, on the performance.
Author
Computer Systems Performance; Computerized Simulation; Computer Systems Design; Performance Tests; Architecture (Computers); Parallel Processing (Computers); Distributed Memory

20030057208 Lawrence Livermore National Lab., Livermore, CA
Memory Benchmarks for SMP-Based High Performance Parallel Computers
Yoo, A. B.; de Supinski, B. R.; Mueller, F.; McKee, S. A.; Nov. 20, 2001; 24 pp.; In English
Report No.(s): DE2003-15002524; UCRL-JC-146246; No Copyright; Avail: Department of Energy Information Bridge

As the speed gap between CPU and main memory continues to grow, memory accesses increasingly dominate the performance of many applications. The problem is particularly acute for symmetric multiprocessor (SMP) systems, where the shared memory may be accessed concurrently by a group of threads running on separate CPUs. This paper has four primary contributions. First, we introduce a microbenchmark suite to systematically assess and compare the performance of different levels in SMP memory hierarchies. Second, we present a new tool based on hardware performance monitors to determine a wide array of memory system characteristics, such as cache sizes, quickly and easily; by using this tool, memory performance studies can be targeted to the full spectrum of performance regimes with many fewer data points than is otherwise required. Third, we present experimental results indicating that the performance of applications with large memory footprints remains largely constrained by memory. Fourth, we demonstrate that thread-level parallelism further degrades memory performance, even for the latest SMPs with hardware prefetching and switch-based memory interconnects.
NTIS
Memory (Computers); Parallel Processing (Computers)

20030057287 Lawrence Livermore National Lab., Livermore, CA
Science and Technology Review: Supercomputing Takes Another Giant Step
Jun. 2000; In English
Report No.(s): DE2003-791642; No Copyright; Avail: National Technical Information Service (NTIS)

This issue contains the following articles: (1) Accelerating on the ASCI Challenge; (2) New Day Daws in Supercomputing-When the ASCI White supercomputer comes online this summer, DOE's Stockpile Stewardship Program will make another significant advanced toward helping to ensure the safety, reliability, and performance of the nation's nuclear weapons; (3) Uncovering the Secrets of Actinides-Researchers are obtaining fundamental information about the actinides, a group of elements with a key role in nuclear weapons and fuels; (4) A Predictable Structure for Aerogels and (5) Tibet--Where Continents Collide.
NTIS
Technology Assessment; Supercomputers; Research And Development

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20030055690 ASRC Aerospace Corp., Cocoa Beach, FL, USA
ASRC Aerospace Corporation Selects Dynamically Reconfigurable Anadigm(Registered Trademark) FPAA For Advanced Data Acquisition System
Mata, Carlos T.; [2003]; 2 pp.; In English
Contract(s)/Grant(s): NAS10-03006
Report No.(s): KSC-2003-067; No Copyright; Avail: CASI

Anadigm(registered trademark) today announced that ASRC Aerospace Corporation has designed Anadigm's dynamically reconfigurable Field Programmable Analog Array (FPAA) technology into an advanced data acquisition system developed under contract for NASA. ASRC Aerospace designed in the Anadigm(registered trademark) FPAA to provide complex analog signal conditioning in its intelligent, self-calibrating, and self-healing advanced data acquisition system (ADAS). The ADAS has potential applications in industrial, manufacturing, and aerospace markets. This system offers highly reliable operation while reducing the need for user interaction. Anadigm(registered trademark)'s dynamically reconfigurable

FPAAs can be reconfigured in-system by the designer or on the fly by a microprocessor. A single device can thus be programmed to implement multiple analog functions and/or to adapt on-the-fly to maintain precision operation despite system degradation and aging. In the case of the ASRC advanced data acquisition system, the FPAA helps ensure that the system will continue to operating at 100\% functionality despite changes in the environment, component degradation, and/or component failures.
Author
Data Systems; Computer Programming; Data Acquisition; Signal Processing; Analog Computers; Computer Networks

20030056678 Michigan Univ., Ann Arbor, MI, USA
High Performance Parallel Methods for Space Weather Simulations
Hunter, Paul, Technical Monitor; Gombosi, Tamas I.; June 09, 2003; 6 pp.; In English
Contract(s)/Grant(s): NAG5-9406; No Copyright; Avail: CASI; A02, Hardcopy

This is the final report of our NASA AISRP grant entitled 'High Performance Parallel Methods for Space Weather Simulations'. The main thrust of the proposal was to achieve significant progress towards new high-performance methods which would greatly accelerate global MHD simulations and eventually make it possible to develop first-principles based space weather simulations which run much faster than real time. We are pleased to report that with the help of this award we made major progress in this direction and developed the first parallel implicit global MHD code with adaptive mesh refinement. The main limitation of all earlier global space physics MHD codes was the explicit time stepping algorithm. Explicit time steps are limited by the Courant-Friedrichs-Lewy (CFL) condition, which essentially ensures that no information travels more than a cell size during a time step. This condition represents a non-linear penalty for highly resolved calculations, since finer grid resolution (and consequently smaller computational cells) not only results in more computational cells, but also in smaller time steps.
Author
Coding; Applications Programs (Computers); Computerized Simulation; Astronomical Models; Mathematical Models; Space Weather; Algorithms

20030057169 Rutherford Appleton Lab., Oxford, UK
Introduction to Algorithms for Nonlinear Optimization
Gould, N. I. M.; Leyffer, S.; Dec. 17, 2002; In English
Report No.(s): PB2003-103706; RAL-TR-2002-031; No Copyright; Avail: National Technical Information Service (NTIS)

We provide a concise introduction to modern methods for solving nonlinear optimization Problems. We consider both line-search and trust-region methods for unconstrained Minimization, interior-point methods for problems involving inequality constraints, and SQP methods for those involving equality constraints. Theoretical as well as practical aspects are emphasized. We conclude by giving a personal view of some of the most significant papers in the area, and a brief guide to on-line resources.
NTIS
Algorithms; Nonlinearity; On-Line Systems

20030057254 Alstom Power Environmental Systems, Knoxville, TN, Fluent, Inc., Lebanon, NH, USA
Development of Technologies and Analytical Capabilities for Vision 21 Energy Plants. Discussion on Test and Demonstration Case 2
Richards, G. R.; Sloan, D.; Fiveland, W.; Aug. 31, 2002; 16 pp.; In English
Report No.(s): DE2003-807225; No Copyright; Avail: Department of Energy Information Bridge

The goal of this DOE Vision-21 project work scope is to develop an integrated suite of software tools that can be used to simulate and visualize advanced plant concepts. Existing process simulation software does not meet the DOE's objective of 'virtual simulation' which is needed to evaluate complex cycles. The overall intent of the DOE is to improve predictive tools for cycle analysis, and to improve the component models that are used in turn to simulate the cycle. Advanced component models are available; however, a generic coupling capability that will link the advanced component models to the cycle simulation software remains to be developed. In the current project, the coupling of the cycle analysis and cycle component simulation software will be based on an existing suite of programs. The challenge is to develop a general-purpose software and communications link between the cycle analysis software Aspen Plus v (marketed by Aspen Technology, Inc.), and

specialized component modeling packages, as exemplified by industrial proprietary codes (utilized by ALSTOM Power Inc.) and the FLUENT CFD code (provided by Fluent Inc).
NTIS
Alcohols; Power Plants; Propylene

62
COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20030056689 NASA Ames Research Center, Moffett Field, CA, USA
Aspects, Wrappers and Events
Filman, Robert E.; [2003]; 66 pp.; In English; No Copyright; Avail: CASI; A04, Hardcopy

This viewgraph presentation provides information on Object Infrastructure Framework (OIF), an Aspect-Oriented Programming (AOP) system. The presentation begins with an introduction to the difficulties and requirements of distributed computing, including functional and non-functional requirements (ilities). The architecture of Distributed Object Technology includes stubs, proxies for implementation objects, and skeletons, proxies for client applications. The key OIF ideas (injecting behavior, annotated communications, thread contexts, and pragma) are discussed. OIF is an AOP mechanism; AOP is centered on: 1) Separate expression of crosscutting concerns; 2) Mechanisms to weave the separate expressions into a unified system. AOP is software engineering technology for separately expressing systematic properties while nevertheless producing running systems that embody these properties.
CASI
Computer Programming; Software Engineering; Computer Systems Design; Computer Networks

20030057152 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Goddard's New Data Analysis System
Worth, Daniel B.; [2002]; 1 pp.; In English; 2002 Meeting of the AIAA Working Group on Dynamic Space Simulation, 23-27 Sep. 2002, Toulouse, France; No Copyright; Avail: Other Sources; Abstract Only

After evaluating the total lifetime costs of various commercial systems, it was determined that an in-house development would be more cost-effective in the long run. Matlab was chosen as the development platform, since it is now being taught to most engineering students. The presentation will discuss the specifications of the system.
Author
Data Processing; Software Development Tools; Computer Systems Design

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20030055627 San Jose State Univ., CA, USA
Error Generation in CATS-Based Agents
Callantine, Todd; May 2003; 53 pp.; In English
Contract(s)/Grant(s): RTOP 728-20-10
Report No.(s): NASA/CR-2003-212263; NAS 1.26:212263; IH-039; No Copyright; Avail: CASI; A04, Hardcopy

This research presents a methodology for generating errors from a model of nominally preferred correct operator activities, given a particular operational context, and maintaining an explicit link to the erroneous contextual information to support analyses. It uses the Crew Activity Tracking System (CATS) model as the basis for error generation. This report describes how the process works, and how it may be useful for supporting agent-based system safety analyses. The report presents results obtained by applying the error-generation process and discusses implementation issues. The research is

supported by the System-Wide Accident Prevention Element of the NASA Aviation Safety Program.
Author
Applications Programs (Computers); Man Machine Systems; Pilot Performance; Computerized Simulation; Error Analysis; Errors; Probability Theory; Combinatorial Analysis

20030057190 Fluor Daniel Hanford, Inc., Richland, WA, USA
Honeywell Modular Automation System Computer Documentation for the Magnesium Hydroxide Precipitation Process
Stubbs, A. M.; Jun. 21, 2001; 104 pp.; In English
Report No.(s): DE2003-807152; HNF-7535-REV-1; No Copyright; Avail: Department of Energy Information Bridge

The purpose of this Computer Software Document (CSWD) is to provide configuration control of the Honeywell Modular Automation System (MAS) in use at the Plutonium Finishing Plant (PFP) for the Magnesium Hydroxide Precipitation Process in Rm 230'3234-52. The magnesium hydroxide process control software Rev 0 is being updated to include control programming for a second hot plate. The process control programming was performed by the system administrator. Software testing for the additional hot plate was performed per PFP Job Control Work Package 22-00-1 703. The software testing was verified by Quality Control to comply with OSD-Z-184-00044, Magnesium Hydroxide Precipitation Process. The current magnesium hydroxide process software is Rev 1. The software consists of a recordable CD and two-3.5 disks. The software update is dated 03-1 3-2001.
NTIS
Precipitation; Control; Computer Systems Design; Magnesium; Hydroxides

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20030057199 Swedish Defence Research Establishment, Linkoeping, Sweden
A Frame of Reference to Describe Dynamic Decision Making in a Commander's Training Centre
Kylesten, B.; Dec. 2001; In Swedish
Report No.(s): PB2003-103212; FOI-R-0340-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of the study was to investigate general methods in order to describe and measure decision making. Furthermore, the purpose of the study was to investigate whether the decision task was interpreted as dynamic. In order to make this possible both a method and a measure of description were tested, which could be used in following studies to elucidate differences after training of the decision making process. The basis of the study is theories about dynamic decision making, mainly from Brehmer and Dorner. The study was performed with battalion commanders and rescue leaders training in a commander's training center, and with chairmen of the city executive board under similar conditions. The results of this study show that the decision task is dynamic, that the method can describe dynamic decision making, and that the results are a foundation for the next study. The aim of the subsequent research is to give a foundation for valuation of decision making training in dynamic situations by means of micro worlds.
NTIS
Decision Making; Rescue Operations

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20030055631 NASA Glenn Research Center, Cleveland, OH, USA
Comparisons of Gas-Phase Temperature Measurements in a Flame Using Thin-Filament Pyrometry and Thermocouples
Struk, Peter; Dietrich, Daniel; Valentine, Russell; Feier, Ioan; February 2003; 16 pp.; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 101-32-06
Report No.(s): NASA/TM-2003-212096; AIAA Paper 2003-853; NAS 1.15:212096; E-13749; No Copyright; Avail: CASI; A03, Hardcopy

Less-intrusive, fast-responding, and full-field temperature measurements have long been a desired tool for the research community. Recently, the emission of a silicon-carbide (SiC) fiber placed in a flowing hot (or reacting) gas has been used to measure the temperature profile along the length of the fiber. The relationship between the gas and fiber temperature comes from an energy balance on the fiber. In the present work, we compared single point flame temperature measurements using thin-filament pyrometry (TFP) and thermocouples. The data was from vertically traversing a thermocouple and a SiC fiber through a methanol/air diffusion flame of a porous-metal wick burner. The results showed that the gas temperature using the TFP technique agreed with the thermocouple measurements (25.4 m diameter wire) within 3.5\% for temperatures above 1200 K. Additionally, we imaged the entire SiC fiber (with a spatial resolution of 0.14 mm) while it was in the flame using a high resolution CCD camera. The intensity level along the fiber length is a function of the temperature. This results in a one-dimensional temperature profiles at various heights above the burner wick. This temperature measurement technique, while having a precision of less than 1 K, showed data scatter as high as 38 K. Finally, we discuss the major sources of uncertainty in gas temperature measurement using TFP.
Author
Gas Flow; Flame Temperature; Temperature Measurement; Thermocouples; Diffusion Flames; High Temperature Gases

20030056724 California Univ., Los Angeles, CA, USA
Dynamical Evolution of Coherent Structures in Intermittent Two-Dimensional MHD Turbulence
Wu, Cheng-Chin; Chang, Tom; IEEE Transactions on Plasma Science; December 2000; ISSN 0093-3813; Volume 28, No. 6, pp. 1938-1943; In English
Contract(s)/Grant(s): NAG5-9111; Copyright; Avail: Other Sources
Recent satellite observations indicate that the Earth s magnetotail is generally in a state of intermittent turbulence. A model of sporadic localized merging of coherent structures has recently been proposed by Chang to describe the dynamics of the Earth s magnetotail. Here we report the results of MHD simulations regarding the development and merging of two-dimensional coherent structures. With a magnetic shear, such coherent structures are generated in alignment with the imposed current sheet. The calculated fluctuation spectra suggest long-ranged correlations with power-law characteristics.
Author
Coherence; Magnetohydrodynamic Turbulence; Dynamics; Turbulence

20030057165 Lawrence Livermore National Lab., Livermore, CA
Calculated Thermodynamic Functions for Gas Phase Uranium, Neptunium, Plutonium, and Americium Oxides (AnO(sub3)), Oxyhydroxides (AnO(sub 2)(OH)sub 2), Oxychlorides (AnO(sub 2)CI(sub 2)), and Oxyfluorides (AnO(sub2)F(sub 2))
Ebbinghaus, B. B.; Oct. 31, 2002; 50 pp.; In English
Report No.(s): DE2003-15002515; UCRL-ID-122278; No Copyright; Avail: Department of Energy Information Bridge
No abstract available.
NTIS
Computation; Thermodynamic Properties; Gases

20030057185 Lawrence Livermore National Lab., Livermore, CA
Wake Properties of a Stripline Beam Kicker
Poole, B. R.; Caporaso, G. J.; Ng, W. C.; May 27, 1997; 10 pp.; In English
Report No.(s): DE2003-16396; UCRL-JC-126075-Rev-1; No Copyright; Avail: Department of Energy Information Bridge
The transport of a high current relativistic electron beam in a stripline beam kicker is strongly dependent on the wake properties of the structure. The effect of the beam-induced fields on the steering of the beam must be determined for a prescribed trajectory within the structure. A 3-D time domain electromagnetic code is used to determine the wake fields and the resultant Lorentz force on the beam both for an ultra-relativistic electron beam moving parallel to the beamline axis as well as a beam that follows a curved trajectory through the structure. Usually in determining the wake properties of the structure, a wake impedance is found for a beam that is moving parallel to the beamline axis. However, we extend this concept to curved trajectories by calculating beam induced forces along the curved trajectory. Comparisons are made with simple transmission line models of the structure. The wake properties are used in models to transport the beam self-consistently through the structure.
NTIS
Electron Beams; Accelerators

20030057194 Lawrence Livermore National Lab., Livermore, CA

Germanium-Based, Coded Aperture Imager

Ziock, K. P.; Madden, N.; Hull, E.; Craig, W.; Lavietes, T.; Oct. 31, 2001; 12 pp.; In English

Report No.(s): DE2003-15002753; UCRL-JC-146131; No Copyright; Avail: Department of Energy Information Bridge

We describe a coded-aperture based, gamma-ray imager that uses a unique hybrid germanium detector system. A planar, germanium strip detector, eleven millimeters thick is followed by a coaxial detector. The 19 x 19 strip detector (2 mm pitch) is used to determine the location and energy of low energy events. The location of high energy events are determined from the location of the Compton scatter in the planar detector and the energy is determined from the sum of the coaxial and planar energies. With this geometry, we obtain useful quantum efficiency in a position-sensitive mode out to 500 keV. The detector is used with a 19 x 17 URA coded aperture to obtain spectrally resolved images in the gamma-ray band. We discuss the performance of the planar detector, the hybrid system and present images taken of laboratory sources.

NTIS

Imaging Techniques; Germanium; Sensitivity; Detectors

20030057195 Lawrence Livermore National Lab., Livermore, CA

Wake Properties of a Stripline Beam Kicker

Poole, B. R.; Caporaso, G. J.; Ng, W. C.; May 08, 1997; 10 pp.; In English

Report No.(s): DE2003-16381; UCRL-JC-126075; No Copyright; Avail: Department of Energy Information Bridge

The transport of a high current relativistic electron beam in a stripline beam kicker is strongly dependent on the wake properties of the structure. The effect of the beam-induced fields on the steering of the beam must be determined for a prescribed trajectory within the structure. A 3-D time domain electromagnetic code is used to determine the wake fields and the resultant Lorentz fcme on the beam both for an ultra-relativistic electron beam moving parallel to the beamline axis as well as a beam that follows a curved trajectory through the structure. Usually in determining the wake properties of the structure, a wake impedance is found for a beam that is moving parallel to the beamline axis. However, we extend this concept to curved trajectories by calculating beam induced fonms along the curved trajectory. Comparisons are made with simple transmission line models of the structure. The wake properties axe used in models to transport the beam self-consistently through the structure.

NTIS

Electron Beams; Impedance; Magnets

20030057197 Lawrence Livermore National Lab., Livermore, CA

AMG/FOSLS for LLNL Applications

Brezina, M.; Jones, J.; Sep. 23, 2001; 16 pp.; In English

Report No.(s): DE2003-15002760; UCRL-CR-147711; No Copyright; Avail: Department of Energy Information Bridge

The work included improving parallel scalability of the multilevel software package ML, and concentrated on improving robustness and convergence properties of the Smoothed Aggregation Multilevel Iterative Solver (SAMISdat(AMG)) for solution of second order problems. Although both scalar and nonscalar problems were targeted, the emphasis was on treatment of nonscalar problems of thin body elasticity such as encountered with ALE3D.

NTIS

Applications Programs (Computers); Elastic Properties; Robustness (Mathematics); Scalars

20030057213 Lawrence Livermore National Lab., Livermore, CA

Evidence of Critical Scaling Behavior During Vapor Phase Synthesis of Continuous Filament Composites

Kinney, J. H.; Haupt, D. L.; Feb. 1997; 10 pp.; In English

Report No.(s): DE2003-16407; UCRL-JC-126856; No Copyright; Avail: Department of Energy Information Bridge

The authors present experimental measurements of the accessible pore fraction in ceramic matrix composites during consolidation by vapor phase infiltration. For two topologically distinct filament architectures, the accessible pore fraction decreased during consolidation with a power law decay and a critical scaling exponent of 0.41 (R(sup 2)= 0.97). A three-dimensional analysis of the percolating pores revealed that the structures became topologically equivalent and simply connected near the critical density.

NTIS

Scaling; Ceramics

20030057219 Brookhaven National Lab., Upton, NY, USA

Sub-Picosecond Pulsed 5 MeV Electron Beam System

Farrell, J. P.; Batchelor, K.; Meshkovsky, I.; Pavlishin, I.; Lekomstev, V.; 2001; 10 pp.; In English

Report No.(s): DE2003-804091; No Copyright; Avail: Department of Energy Information Bridge

Laser excited pulsed, electron beam systems that operate at energies from 1 MeV up to 5 MeV and pulse width from 0.1 to 100 ps are described. The systems consist of a high voltage pulser and a coaxial laser triggered gas or liquid spark gap. The spark gap discharges into a pulse forming line designed to produce and maintain a flat voltage pulse for 1 ns duration on the cathode of a photodiode. A synchronized laser is used to illuminate the photocathode with a laser pulse to produce an electron beam with very high brightness, short duration and current at or near the space charge limit. Operation of the system is described and preliminary test measurements of voltages, synchronization and jitter are presented for a 5 MeV system. Applications in chemistry, and accelerator research are briefly discussed.

NTIS

Electron Beams; Accelerators; Pulsed Lasers; Pulse Generators; Synchronism

20030057228 Brookhaven National Lab., Upton, NY, USA

Mechanical and Shielding Design of a Portable Spectrometer Beam Dump Assembly at BNL's Accelerator Test Facility

Hu, J. P.; Casey, W. R.; Harder, D. A.; Pjerov, S.; Rakowsky, G.; Oct. 2002; 14 pp.; In English

Report No.(s): DE2003-804009; BNL-69398; No Copyright; Avail: Department of Energy Information Bridge

A portable assembly containing a vertical-bend dipole magnet has been designed and installed immediately down-beam of the Compton electron-laser interaction chamber on beamline 1 of the Accelerator Test Facility (ATF) at Brookhaven National Laboratory (BNL). The watercooled magnet designed with field strength of up to 0.7 Tesla will be used as a spectrometer in the Thompson scattering and vacuum acceleration experiments, where field-dependent electron scattering, beam focusing and energy spread will be analyzed. This magnet will deflect the ATF's 60 MeV electron-beam 90 degrees downward, as a vertical beam dump for the Compton scattering experiment. The dipole magnet assembly is portable, and can be relocated to other beamlines at the ATF or other accelerator facilities to be used as a spectrometer or a beam dump.

NTIS

Electron Beams; Mechanical Engineering; Portable Equipment; Spectrometers; Test Facilities; Particle Accelerators

20030057233 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

Automated Startup of the Cebaf 45 MeV Injector

Kehne, D.; Letta, P.; Dunham, B.; Kazimi, R.; Jun. 01, 1997; 10 pp.; In English

Report No.(s): DE2003-555566; JLAB-ACO-97-03; No Copyright; Avail: Department of Energy Information Bridge

In order to improve the speed and reproducibility of restoring the beam in the Continuous Electron Beam Accelerator Facility (CEBAF) 45 MeV injector after a full or partial shutdown of the accelerator, a program has been written using the Tcl/Tk scripting language to automate most of the required steps. The procedure is separated into four main parts. The first part performs preliminary checks that verify that the hardware is set correctly and then turns on the main interlocked systems including high power magnets and RF. The second step turns on the gun high voltage. The final steps turn on the beam and verify that the beam quality is satisfactory by measuring the transmission, orbit, transverse beam size, and bunch length. Minor corrections for phasing are also performed in the program. In order to identify inefficiencies in the startup, each is timed and parameter changes are logged so that system drifts can be tracked. This paper describes the software implementation, the logic to achieve a successful startup, and efficiency results.

NTIS

Linear Accelerators; Computer Programs; Electron Beams; Injectors

20030057240 Lawrence Livermore National Lab., Livermore, CA

Temperature and Emissivity of a Shocked Surface: A First Experiment

Poulsen, P.; Hare, D. E.; Feb. 04, 2002; In English

Report No.(s): DE2003-15002512; UCRL-ID-146845; No Copyright; Avail: National Technical Information Service (NTIS)

We have conducted an experiment in which the temperature and the wavelength dependent emissivity of a shocked surface has been measured. In the past, only the thermal emission from the shocked surface has been measured. The lack of knowledge of the emissivity as a function of wavelength leads to uncertainty in converting the measured emission spectrum into a surface temperature. We have developed a technique by which we are able to calculate both the emissivity of the shocked surface over a range of relevant wavelengths and the temperature of the surface. We use a multi-channel spectrometer

in combination with a pulsed light source having a known spectrum of infrared radiation. Two separate techniques using a pulse of reflected radiation are employed and described.
NTIS
Emission Spectra; Emissivity; Temperature Dependence; Reflected Waves; Shock Waves

20030057242 Lawrence Livermore National Lab., Livermore, CA
Preliminary Report on the Population of the 235 U T (sub one-half)= 25-Minute Isomer by the (n, n(prime)gamma) Reaction
Younes, W.; Britt, H. C.; Becker, J. A.; Bernstein, L. A.; Garrett, P. E.; Oct. 09, 2002; 46 pp.; In English
Report No.(s): DE2003-15002516; UCRL-ID-151071; No Copyright; Avail: Department of Energy Information Bridge
The population cross section of the T (sub one-half) = 25-minute, E(x) = 76.8-keV isomer in 235 U via the 235 U(n,n(prime)gamma) reaction has been estimated in the E(n) = 2.1-20-MeV range. Gamma rays populating both isomer and ground states were detected using the GEANIE spectrometer at the LAN- SCE/WNR 'white-source' neutron facility. Partial x-ray cross sections were obtained as a function of incident neutron energy, using x-ray spectroscopy and the time-of-flight technique. A correction for unobserved transitions was applied to the measured partial cross sections using the Hauser-Feshbach code GNASH to produce population cross sections for the isomer- and ground-state levels. The deduced isomer population cross section at E(n) = 2.1 MeV is 1.1(1) b, and the isomer-to-ground state population ratio decreases from 0.9 to 0.06 over the E(n) = 2.1-20-MeV range. The details of the measurement and recommendations to improve the current results are discussed.
NTIS
Uranium 235; Chemical Reactions; Isomers; Nuclear Chemistry

20030057245 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Polarized Targets for the Clas Detector at Jefferson Lab
Keith, C. D.; 2000; 10 pp.; In English
Report No.(s): DE2003-804050; No Copyright; Avail: Department of Energy Information Bridge
The CEBAF Large Acceptance Spectrometer is utilized for a wide ranging physics program at Jefferson Lab, including measurements of polarized structure functions and future tests of the Gerasimov-Drell-Hearn sum rule. To realize the entire extent of the program, polarized targets that can function inside the spectrometer without severely affecting its performance are necessary. In these proceedings, I describe a continuously polarized solid target of protons and deuterons that operated inside CLAS for a total of ten months from 1998 to 2001. The conceptual design of a frozen spin target that will more fully exploit the 4 pi acceptance of CLAS is also introduced.
NTIS
Linear Accelerators; Rangefinding; Polarized Radiation

20030057249 Brookhaven National Lab., Upton, NY, Academia Sinica, Beijing, China
Cryogenics in BEPCII Upgrade
Jia, L.; Wang, L.; Li, S.; Jul. 2002; 10 pp.; In English
Report No.(s): DE2003-804088; BNL-69211; No Copyright; Avail: Department of Energy Information Bridge
This paper presents cryogenic design for upgrading the Beijing Electron-Positron Collider (BEPC) at the Institute of High Energy Physics (IHEP) in Beijing. The upgrade involves three new superconducting facilities, the interaction region quadrupole magnets, the detector solenoid magnets, and the SRF cavities. For cooling of these devices, a new cryoplant with a total capacity of 1.0 kW at 4.5K is to be built at MEP. An integrated cryogenic design to fit the BEPCII cryogenic loads with high efficiency is carried out using computational process analysis software with the emphases on economics and safety in both construction and operation of the plant. This paper describes the cryogenic characteristics of each superconducting devices, their cooling schemes, and the overall cryoplant.
NTIS
Cryogenics; Upgrading; Superconducting Devices; Structural Design

20030057251 Rochester Univ., NY, USA
Off The Mass Shell: Electroweak Physics at NUTEV
McFarland, K. S.; Jan. 2003; 16 pp.; In English
Report No.(s): DE2003-807169; No Copyright; Avail: Department of Energy Information Bridge

No abstract available
NTIS
Electroweak Interactions (Field Theory); Weak Interactions (Field Theory)

20030057265 Lawrence Livermore National Lab., Livermore, CA
New Trends in Induction Accelerator Technology
Caporaso, G. J.; Dec. 05, 2002; In English
Report No.(s): DE2003-15002763; UCRL-JC-150674; No Copyright; Avail: National Technical Information Service (NTIS)
Recent advances in solid-state modulators now permit the design of a new class of high current accelerators. These new accelerators will be able to operate in burst mode at frequencies of several MHz with unprecedented flexibility and precision in pulse format. These new modulators can drive accelerators to high average powers that far exceed those of any other technology and can be used to enable precision beam manipulations. New insulator technology combined with novel pulse forming lines and switching may enable the construction of a new type of high gradient, high current accelerator. Recent developments in these areas will be reviewed.
NTIS
Construction; High Current

20030057280 Fermi National Accelerator Lab., Batavia, IL, USA, British Columbia Univ., Vancouver, British Columbia, Canada
FFAGS for Rapid Acceleration
Johnstone, C.; Koscielniak, S.; Sep. 2002; In English
Report No.(s): DE2003-801544; FERMILAB-CONF-02/223-T; No Copyright; Avail: National Technical Information Service (NTIS)
When large transverse and longitudinal emittances are to be transported through a circular machine, extremely rapid acceleration holds the advantage that the beam becomes immune to nonlinear resonances because there is insuociant time for amplitudes to build up. Uncooled muon beams exhibit large emittances and require fast acceleration to avoid decay losses and would benefit from this style of acceleration. The approach here employs a fixed-field alternating gradient or FFAG magnet structure and a fixed frequency acceleration system. Acceptance is enhanced by the use only of linear lattice elements, and fixed-frequency rf enables the use of cavities with large shunt resistance and quality factor.
NTIS
Emittance; Beams (Radiation); Nonlinearity

20030057281 Lawrence Livermore National Lab., Livermore, CA
Interaction Region Vacuum System Design at the PEP-II B Factory
Bertolini, L.; Alford, O.; Duffy, P.; Holmes, R.; Mullins, L.; Jul. 21, 1997; 10 pp.; In English
Report No.(s): DE2003-16393; UCRL-JC-128067; No Copyright; Avail: Department of Energy Information Bridge
The Interaction Region Vacuum System in the PEP-II B-Factory at SLAC must produce average pressures in the 10(sup -10) Torr range. Low beamline pressures will minimize the background radiation encountered by the BaBar Detector. A combination of copper and stainless steel vacuum chambers with continuous antechambers are used to make up the beam tubes. Linear Non-Evaporable Getter (NEG) pumps are used to produce distributed pumping along the length of these beam tubes. High conductance microwave type screens provide RF shields between the beam aperture and the NEG pumps. In this paper the design features of the beam tubes, NEG pumps, and RF pump screens are described and the vacuum and impedance analyses conducted in support of the design are discussed.
NTIS
Getters; Accelerators; Vacuum Systems

20030057284 Brookhaven National Lab., Upton, NY, USA
Revitalized NSLS VUV Ring
Hulbert, S. L.; Oct. 1999; 14 pp.; In English
Report No.(s): DE2003-750780; BNL-67003; No Copyright; Avail: Department of Energy Information Bridge
A status report on the revitalization of the NSLS VUV ring will be presented, concentrating on three areas: (1) the four infrared ports (U2A/B, U4IR, U10A/B, and U12IR), (2) conversion of out-of-date toroidal grating monochromators to spherical grating type (U4A, U7A, and U12A), and (3) new insertion device beamlines (U5UA and U13UB). All of these

beamlines were designed (new ones) or upgraded (old ones) to serve a specific scientific need represented by the PRTs (both NSLS and non-NSLS based) involved. Therefore, an overview of the scientific programs served by these new beamlines will be given, as well as a summary of the beamline optical designs and operating performance.
NTIS
Storage Rings (Particle Accelerators); Synchrotron Radiation

71
ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20030055692 NASA Glenn Research Center, Cleveland, OH, USA
Numerical and Experimental Determination of the Geometric Far Field for Round Jets
Koch, L. Danielle; Bridges, James; Brown, Cliff; Khavaran, Abbas; May 2003; 15 pp.; In English; Noise-Con 2003, 23-25 Jun. 2003, Cleveland, OH, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 22-781-30-12
Report No.(s): NASA/TM-2003-212379; E-13956; NAS 1.15:212379; Copyright; Avail: CASI; A03, Hardcopy

To reduce ambiguity in the reporting of far field jet noise, three round jets operating at subsonic conditions have recently been studied at the NASA Glenn Research Center. The goal of the investigation was to determine the location of the geometric far field both numerically and experimentally. The combination of the WIND Reynolds-Averaged Navier-Stokes solver and the MGBK jet noise prediction code was used for the computations, and the experimental data was collected in the Aeroacoustic Propulsion Laboratory. While noise sources are distributed throughout the jet plume, at great distances from the nozzle the noise will appear to be emanating from a point source and the assumption of linear propagation is valid. Closer to the jet, nonlinear propagation may be a problem, along with the known geometric issues. By comparing sound spectra at different distances from the jet, both from computational methods that assume linear propagation, and from experiments, the contributions of geometry and nonlinearity can be separately ascertained and the required measurement distance for valid experiments can be established. It is found that while the shortest arc considered here (approx. 8D) was already in the geometric far field for the high frequency sound (St greater than 2.0), the low frequency noise due to its extended source distribution reached the geometric far field at or about 50D. It is also found that sound spectra at far downstream angles does not strictly scale on Strouhal number, an observation that current modeling does not capture.
Author
Aeroacoustics; Jet Aircraft Noise; Noise Prediction; Far Fields; Subsonic Flow; Numerical Analysis

20030057124 Boeing Commercial Airplane Co., Seattle, WA, USA, Federal Aviation Administration, Washington, DC, USA
Review of Integrated Noise Model (INM) Equations and Processes
Shepherd, Kevin P., Technical Monitor; Forsyth, David W.; Gulding, John; DiPardo, Joseph; May 5, 2003; 55 pp.; In English
Contract(s)/Grant(s): NAS1-97040; 781-20-11-01
Report No.(s): NASA/CR-2003-212414; NAS 1.26:212414; No Copyright; Avail: CASI; A04, Hardcopy

The FAA's Integrated Noise Model (INM) relies on the methods of the SAE AIR-1845 'Procedure for the Calculation of Airplane Noise in the Vicinity of Airports' issued in 1986. Simplifying assumptions for aerodynamics and noise calculation were made in the SAE standard and the INM based on the limited computing power commonly available then. The key objectives of this study are 1) to test some of those assumptions against Boeing source data, and 2) to automate the manufacturer's methods of data development to enable the maintenance of a consistent INM database over time. These new automated tools were used to generate INM database submissions for six airplane types :737-700 (CFM56-7 24K), 767-400ER (CF6-80C2BF), 777-300 (Trent 892), 717-200 (BR7 15), 757-300 (RR535E4B), and the 737-800 (CFM56-7 26K).
Author
Aircraft Noise; Noise Prediction (Aircraft); Aircraft Models; Aerodynamic Noise; Jet Aircraft

20030057131 Defence Science and Technology Organisation, Edinburgh, Australia
Use of Spherical Objects as Calibrated Minehunting Sonar Targets
Anstee, Stuart; December 2002; 33 pp.; In English
Report No.(s): DSTO-TN-0425; DODA-AR-012-312; Copyright; Avail: Other Sources

Solid, water-filled and air-filled spheres are investigated for suitability as calibrated targets for active minehunting sonars

operating in the range 10kHz to 200kHz. It is found that all solid and water-filled designs have target strengths that are strongly frequency-dependent, but some air-filled designs are not frequency dependent. It is found that thick-walled spherical glass floats are suitable for some frequency ranges, and thin-walled stainless steel spheres are suitable over the whole frequency range, if they are sufficiently well made and conditions allow their deployment.
Author
Sonar; Spherical Shells; Mine Detectors; Mathematical Models; Targets; Calibrating

20030057234 National Defence Research Establishment, Linkoeping, Sweden
Integration of Optical Sensors for Minehunting in an Underwater Vehicle
Steinvall, O.; Andersson, M.; Tulldahl, M.; Olsson, A.; Zyra, S.; Dec. 2001; In Swedish
Report No.(s): PB2003-103219; FOI-R-0297-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This report exemplifies possibilities for minehunting, based on combined acoustical, electromagnetical and optical sensors. The systems are limited to sensor systems mounted on underwater platforms. The focus of this report is on the optical sensors and how they could be combined with acoustical and electromagnetic sensors. Different types of mines are briefly described, after which an overview of the different sensors is given. The sensor overview is based on earlier studies performed by FOI and other international organizations. Subsequently, some operational aspects from the Swedish Navy are presented. Finally, possible sensor combinations are discussed. Operational aspects from the present methods briefly provide that there is a need for increased range, improvement of classification of mines, and ability to detect buried mines. A laser-based sensor is expected to improve the classification of bottom mines. All discussed sensor combinations include a synthetic aperture sonar or a parametric sonar as the main sensor. The laser-based sensor can possibly detect signatures on the sea bottom above a buried mine, but since this is an indirect method, it is desirable to use a complementary acoustic or electromagnetic sensor in a combined sensor system. The laser-based sensor needs to be evaluated for conditions in Swedish waters and sea bottoms.
NTIS
Optical Measuring Instruments; Underwater Vehicles; Mine Detectors; Underwater Acoustics

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

20030057205 Lawrence Livermore National Lab., Livermore, CA
New Results for a Photon-Photon Collider
Asner, D.; Grzadkowski, B.; Gunion, J. F.; Logan, H. E.; Martin, V.; Aug. 23, 2002; 24 pp.; In English
Report No.(s): DE2003-15002529; UCRL-ID-149844; No Copyright; Avail: Department of Energy Information Bridge

We present new results from studies in progress on physics at a two-photon collider. We report on the sensitivity to top squark parameters of MSSM Higgs boson production in two-photon collisions; Higgs boson decay to two photons; radion production in models of warped extra dimensions; chargino pair production; sensitivity to the trilinear Higgs boson coupling; charged Higgs boson pair production; and we discuss the backgrounds produced by resolved photon-photon interactions.
NTIS
Higgs Bosons; Photons

20030057274 North Carolina Central Univ., Durham, NC, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Radiative Effects in Scattering of Polarized Leptons by Polarized Nucleons and Light Nuclei
Akushevich, I.; Ilyichev, A.; Shumeiko, N.; 2000; 44 pp.; In English
Report No.(s): DE2003-804115; No Copyright; Avail: Department of Energy Information Bridge

Recent developments in the field of radiative effects in polarized lepton-nuclear scattering are reviewed. The processes of inclusive, semi-inclusive, diffractive and elastic scattering are considered. The explicit formulae obtained within the covariant approach are discussed. FORTRAN codes POLRAD, RADGEN, HAPRAD, DIFFRAD and MASCARAD created on the basis of the formulae are briefly described. Applications for data analysis of the current experiments on lepton-nuclear scattering at CERN, DESY, SLAC and TJNAF are illustrated by numerical results.
NTIS
Nuclear Scattering; Leptons

73
NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

20030057215 Fluor Daniel Hanford, Inc., Richland, WA, USA

CSER 99-003, Rev. 1 Criticality Mass of Uranium as Compared to Plutonium-Implications for PFP Processing Uranium

Erickson, D. G.; Greenborg, J.; Jun. 29, 2001; 46 pp.; In English

Report No.(s): DE2003-807147; HNF-4436-REV-1; No Copyright; Avail: Department of Energy Information Bridge

The purpose of this report is to provide information to be used in the evaluation of the CSER and CPS for equipment and activities involved in thermal stabilization. It is well known that for equal mass, (sup 239)Pu is more reactive than (sup 235) Uexcept at fillile material concentration of 100 g/L to 1,000 g/L this range of concentrations, spheres of highly enriched 94\% uranium have a lower critical mass than spheres of 239Pu. Within these same limits, infinite cylinders of highly enriched uranium (sup 235)U in (sup 238) U have a smaller critical diameter than infinite cylinders of (sup 239)Pu. This report determines the fissile concentrations between which (sup 239)Pu is more reactive than uranium (sup 235) U in (sup 238) U. The information can be used for the revision os CSERs and CPS's to allow processing uranium using limits developed for plutonium.

NTIS

Uranium; Fissionable Materials

74
OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20030057156 National Defence Research Establishment, Linkoeping, Sweden

Synthesis, Theoretical Modeling and Characterization of Optical Limiting Materials

Lopes, C.; Eliasson, B.; Nilsson, C.; Norman, P.; Agren, H.; December 2001; In English

Report No.(s): PB2003-103215; FOI-R-0275-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The 'Photonics in defense applications' program is a collaboration between FOI, Universities and industries in Sweden. One of the projects within this program is 'Technical demonstration of electro-optical counter counter-measures.' The goal for this 3-year project is to incorporate protective devices within a model sight with the aim to protect the human eye against laser damage. This report gives a short introduction to the project and summarizes the results obtained on passive optical limiters during the first project year. The optical limiting performance of the compounds was investigated with the dyes in solution. The solutions were prepared with a photopic transmission of approximately 70\%. Eleven new compounds were investigated. The investigations were performed with a frequency doubled Nd:YAG delivering 5 ns pulses at 532 nm. A tunable laser with an optical parametric oscillator (OPO) was also used to perform measurements at various wavelengths. A f/5 arrangement was used in the experiments. A mixture of alkynyplatinum (II), with a photopic transmission of 68\%, gave the best result; clamping values <1microJ were observed for a major part of the visible wavelengths.

NTIS

Electro-Optics; Optical Materials; Protectors; Safety Devices

20030057173 National Defence Research Establishment, Linkoeping, Sweden

Gated Viewing - Initial Tests at Long Ranges

Klasen, L.; Steinvall, O.; Bolander, G.; Elmqvist, M.; Dec. 2001; In Swedish

Report No.(s): PB2003-103213; FOI-R-0302-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes initial tests with gated viewing at long ranges. The purpose was to study the potential for a system combining an IR camera with laser camera for target recognition in the range 5-10 km or longer. As camera tubes for 1550 nm were not available, the measurement was done at 532 nm. To extrapolate the results to future system performance at 1550 nm, a theoretical performance model was used which takes into account the camera and atmospheric influence on resolution and image quality. The angular resolution of the camera was 11 microrad/lp. The tests showed how turbulence could limit the

resolution for horizontal paths close to ground at such short ranges as 2 km. The resolution was then found to be 30-40 microad/lp. During tests at 10 km with a mean height above ground of 60 m, a resolution of 15-14 microrad/lp was obtained. This indicates some turbulence influence. Spatiotemporal processing was proven useful for image quality improvement. Image summation of 5-20 images is recommended for tactical applications, which usually requires motion compensation. Hard- and software based methods for obtaining a homogeneous illumination of the target should also be considered. A tactical system at 1550 nm ought to have better performance than the used 532 nm in atmospheric limited application close to ground.
NTIS
Image Processing; Optical Radar

20030057236 Lawrence Livermore National Lab., Livermore, CA
Nondegenerate Optical Parametric Chirped Pulse Amplification
Jovanovic, I.; Ebbers, C. A.; Stuart, B. C.; Hermann, M. R.; Morse, E. C.; Nov. 07, 2001; 12 pp.; In English
Report No.(s): DE2003-802880; UCRL-JC-146225; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Amplifiers; Lasers

20030057256 National Defence Research Establishment, Linkoeping, Sweden
Measurements of the Noise Properties of Fiberlaser Sensor Systems
Andersson, M.; Kullander, F.; Dec. 2001; In Swedish
Report No.(s): PB2003-103184; FOI-R-0313-SE; No Copyright; Avail: National Technical Information Service (NTIS)
Fiberlasersensors may be used to construct thin all optical towed sonar arrays. Introductory calculations and measurements on a fiberlasersensor are reported. The optical frequency and intensity noise characteristics were studied. The results show that the detection limit of fiberlasersensors is set by the laser frequency noise, as expected. The frequency noise was analyzed using an interferometric detector. The noise was measured with different instruments, both in direct baseband measurements and with an acoustooptic modulator used to generate a carrier wave at 100 MHz. The measured noise spectral characteristics could be explained by fundamental laser properties. The laser frequency noise level was about 50 dB Hz(sup 2)/Hz at 50 Hz and decreased to a level of approximately 10-20 dB Hz(sup2)/Hz between 1 kHz and 20 kHz. At higher frequencies, the noise spectrum was dominated by the relaxation oscillation resonance around 150 kHz. The relaxation oscillation frequency was found to be dependent on the pump laser drive current. Otherwise, the noise characteristics were not found to depend strongly on the laser drive current. The intensity noise spectral characteristics were completely dominated by the relaxation oscillation resonance. The intensity noise was found to be negligible compared to the laser frequency noise in the frequency range below 20 kHz.
NTIS
Fiber Optics; Noise (Sound); Arrays; Noise Spectra

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20030055640 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Plasma Irregularities Characteristics in the Equatorial Ionosphere, by In Situ Measurements
Vieira, Leandro Paulino; 2003; 227 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-9651-TDI/847; Copyright; Avail: CASI; C01, CDROM; A11, Hardcopy
Since 1984, ionospheric and upper atmospheric studies using experiments on board sounding rockets, have been carried out at INPE's Aeronomy Division. Since then several campaigns were carried out, and several scientific results related to the electron density and electric field in the equatorial ionosphere were acquired. Through these results, one can do detailed analysis of the electron density irregularities and phenomena associated with the large variability of the ionosphere. Extensive studies have been made about the analysis and identification of these irregularities from the point of view of the dynamic and eletrodynamic processes responsible for their generation and about their spectral characteristics; however, existing theories are insufficient to explain all the observed mechanisms. In this work, an analysis of the spectral characteristics of the irregularities

observed during four Brazilian rocket launches has been done using the theories of the instability mechanisms of Cross-field (ICF) and Rayleigh-Taylor (IRT) and other presently available theoretical information. The k-spectra of the irregularities were estimated with the aim of getting help in the precise identification of the wave-numbers present, enabling their comparison with the presently known instability processes that can give rise to the observed wave numbers. From these spectra, it was also possible to obtain the spectral index N corresponding to each of the heights chosen, in such a way that it was possible to obtain this parameter for two distinct scale size ranges. Some of the results obtained are discussed and compared with other results reported from other equatorial stations. All the results of the estimations of the processes involved in the production of irregularities are presented. On board magnetometer data, ionograms and data from radar (the last one especially for the third launching) are included, also with the objective of helping in the interpretation and the identification of the noise present in the fluctuation samples. The second contribution is the experimental establishment of the existence of electrostatic waves associated with the plasma irregularities, through the analysis of the fluctuations in electron density along with the fluctuations in the electric field, particularly for the last launch studied.
Author
Electron Density (Concentration); Earth Ionosphere; Electric Fields; Irregularities; Plasmas (Physics); Electromagnetic Spectra; Electrostatic Waves

20030057212 Lawrence Livermore National Lab., Livermore, CA
Analysis of Classical Transport Equations for the Tokamak Edge Plasma
Rognlien, T. D.; Ryutov, D. D.; Sep. 29, 1997; 14 pp.; In English
Report No.(s): DE2003-16405; UCRL-JC-127390; No Copyright; Avail: Department of Energy Information Bridge

The classical fluid transport equations for a magnet-plasma as given, for example, by Braginskii, are complicated in their most general form. Here we obtain the simplest reduced set which contains the essential physics of the tokamak edge problem in slab geometry by systematically applying a parameter ordering and making use of specific symmetries. An important ingredient is a consistent set of boundary conditions as described elsewhere. This model clearly resolves some important issues concerning diamagnetic drifts, high parallel viscosity, and the ambipolarity constraint. The final equations can also serve as a model for understanding the structure of the equations in the presence of anomalous transport terms arising from fluctuations. In fact, Braginskii-like equations are the basis of a number of scrape-off layer (SOL) transport codes. However, all of these codes contain ad hoc radial diffusion terms and often neglect some classical terms, both of which make the self-consistency of the models questionable. Braginskii's equations have been derived from the first principles via the kinetic equations and, thereby, contain such 'built-in' features as the symmetry of kinetic coefficients, and automatic quasineutrality of a cross-field diffusion in a system with toroidal symmetry such as a tokamak. Our model thus maintains these properties.
NTIS
Transport Theory; Tokamak Devices

20030057247 Brookhaven National Lab., Upton, NY
Proceedings of the Electron Ion Collider Workshops Held at Brookhaven National Laboratory on February 26-March 2002, Volume 1, Accelerator Concepts
Davis, M. S.; Deshpande, A.; Ozaki, S.; Venugoplan, R.; 2002; In English
Report No.(s): DE2003-804084; BNL-52663-V-1; No Copyright; Avail: National Technical Information Service (NTIS)

The fifth in the series of Electron Ion Collider Workshops was held at Brookhaven National Laboratory on February 26 - March 2, 2002. The first two days, Feb. 26th & 27th, were dedicated to the accelerator and the interaction point design issues (hence forth called the EIC Accelerator Workshop). On February 28th, March 1st and 2nd the focus shifted to the physics of polarized e-p scattering, un-polarized e-A scattering, and the detector issues (from now on called the EIC Physics Workshop). The aim of the Workshop was to refine the physics goals of this proposed collider facility identified in previous meetings (see list below) and to begin dedicated efforts on the design of the accelerator, interaction region, and proposals for detectors in view of the physics case. The Workshop proceedings are separated into two volumes. Volume I includes the summaries and slides from the presentations of the Accelerator Workshop, while Volume II includes summaries and selected slides from the EIC Physics Workshop.
NTIS
Conferences; Electron Scattering; Atomic Collisions; Ionic Collisions; Research Facilities

20030057279 Lawrence Livermore National Lab., Livermore, CA
Novel Compact Electron Spectrometer for Hot Electron Measurement in Pulsed Laser Solid Interaction
Chen, H.; Patel, P. K.; Price, D. F.; Young, B. K.; Springer, P. T.; Jul. 05, 2002; 16 pp.; In English
Report No.(s): DE2003-15002777; UCRL-JC-149724; No Copyright; Avail: Department of Energy Information Bridge

Ultra-intense laser-matter interactions provide a unique source of temporally short, broad spectrum electrons, which may be utilized in many varied applications. One such, which we are pursuing, is as part of a novel diagnostic to trace magnetic field lines in a magnetically-confined fusion device. An essential aspect of this scheme is to have a detailed characterization of the electron angular and energy distribution. To this effect we designed and constructed a compact electron spectrometer that uses permanent magnets for electron energy dispersion and over 100 scintillating fibers coupled to a 1024x1024 pixel CCD as the detection system. This spectrometer has electron energy coverage from 10 keV to 2 MeV. 1\% tested the spectrometer on a high intensity10 (sup 17) - 10 (sup 21) short pulse (< 100 fs) laser, JanUSP, at Lawrence Livermore National laboratory using various solid targets. The details of the spectrometer and the experimental results will be reported.
NTIS
Electron Spectroscopy; Hot Electrons; Pulsed Lasers

76
SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20030056644 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Effects of Proton Radiation on the Mechanical Properties of Diamond Films
Newton, Robert Lee; Munafo, Paul M., Technical Monitor; [2002]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Diamond possesses many of the sought after material properties desired in present day applications and is also quite radiation resistant. These characteristics make it an ideal candidate for insertion into MicroElectroMechanical Systems (MEMS) technologies, particularly for space-based applications. Most prior radiation studies investigated single crystal, bulk diamond specimens, not polycrystalline thin films. This investigation examined the microstructural effects of irradiating polycrystalline diamond films with various proton dosages (10(exp 15) - 10(exp 17) H+/sq cm). Scanning Electron Microscopy, micro-Raman Spectroscopy, and micro-X-ray Diffraction techniques were used to examine the effects as a function of depth. Strain values were calculated. Results indicate that the diamond lattice is retained, even at maximum irradiation levels. Polycrystalline silicon was also examined for comparative purposes.
Author
Protons; Diamond Films; Microelectromechanical Systems; Microstructure; Radiation Effects; Diamonds

20030057214 Lawrence Livermore National Lab., Livermore, CA
Temperature and Spectral Investigation of Bulk KDP Below Damage Using 355 nm Laser Irradiation
Demos, S. G.; Yan, M.; Staggs, M.; Woods, B. W.; Wu, Z. L.; Oct. 01, 1997; 14 pp.; In English
Report No.(s): DE2003-16409; UCRL-JC-128357; No Copyright; Avail: Department of Energy Information Bridge

A spectral and temperature investigation of fast-grown KDP crystals under high fluence, 355 nm laser irradiation is discussed. Pump-and-probe Raman spectroscopy indicate transient changes of the vibrational spectrum. Photothermal deflection experiments provide information on the temporal behavior of the temperature change. The presence of emission in the visible and NIR spectral regions is attributed to the presence of impurities and/or defects in the crystal.
NTIS
Crystals; Lasers; Irradiation

20030057246 Arizona Univ., Tucson, AZ, USA
Quantum Confinement, Carrier Dynamics and Interfacial Processes in Nanostructural Direct/Indirect-Gap Semiconductor-Glass
Simmons, J. H.; Bukowski, T. J.; 2000; 36 pp.; In English
Report No.(s): DE2003-798490; No Copyright; Avail: Department of Energy Information Bridge

The behavior of semiconductor clusters precipitated in an insulated matrix was investigated. Semiconductor compositions of CdTe, Si and Ge were studies and the insulating matrix was amorphous SiO2. As a function of size, quantum confinement effects were observed in all three composite systems. However significant differences were observed between the direct-gap column 2-6 semiconductors and the indirect-gap column 4 semiconductors.
NTIS
Amorphous Materials; Cadmium Tellurides; Semiconductors (Materials); Cluster Analysis; Metal Clusters

20030057285 Brookhaven National Lab., Upton, NY, USA
Single Bunch Beam Breakup: A General Solution
Wang, J. M.; Mane, S. R.; Towne, N.; Jun. 2000; 10 pp.; In English
Report No.(s): DE2003-760968; BNL-67563; No Copyright; Avail: Department of Energy Information Bridge

Caporaso, Barletta and Neil (CBN) found in a solution to the problem of the single-bunch beam breakup in a linac. However, their method applies only to the case of a beam traveling in a strongly betatron-focused linac under the influence of the resistive wall impedance. We suggest in this paper a method for dealing with the same problem. Our methods is more general; it applies to the same problem under any impedance, and it applies to a linac with or without external betatron focusing.

NTIS
Beamforming; Electron Bunching

20030057289 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Comparative Dosimetric Estimates of a 25 KeV Electron Microbeam with Three Monte Carlo Codes
Mainardi, E.; Donahue, R. J.; Blakely, E. A.; Sep. 2002; In English
Report No.(s): DE2003-803851; LBNL-50863; No Copyright; Avail: National Technical Information Service (NTIS)

The calculations presented compare the different performances of the three Monte Carlo codes: PENetration and Energy LOss of Positrons and Electrons code (PENELOPE-1999), Monte Carlo N-Particle transport code system (MCNP-4C), Positive Ion Track Structure code (PITS), used for the evaluation of dose profiles from a 25 keV electron micro-beam traversing individual cells. The overall model of a cell is a water cylinder equivalent for the three codes but with a different internal scoring geometry: water filled cylindrical shells for PENELOPE and MCNP, whereas spheres are used for the PITS code. A cylindrical cell geometry with scoring volumes with the shape of water filled cylindrical shells was initially selected for PENELOPE and MCNP because of its superior simulation of the actual shape and dimensions of a cell and for its improved computer-time efficiency if compared to spherical internal volumes.

NTIS
Electrons; Photons; Monte Carlo Method

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

20030057218 Lawrence Livermore National Lab., Livermore, CA
Positron Annihilation in Insulating Materials
Asika-Kumar, P.; Sterne, P. A.; Oct. 18, 2002; In English
Report No.(s): DE2003-15002526; UCRL-JC-149558; No Copyright; Avail: National Technical Information Service (NTIS)

We describe positron results from a wide range of insulating materials. We have completed positron experiments on a range of zeolite-y samples, KDP crystals, alkali halides and laser damaged SiO2. Present theoretical understanding of positron behavior in insulators is incomplete and our combined theoretical and experimental approach is aimed at developing a predictive understanding of positrons and positronium annihilation characteristics in insulators. Results from alkali halides and alkaline-earth halides show that positrons annihilate with only the halide ions, with no apparent contribution from the alkali or alkaline-earth cations. This contradicts the results of our existing theory for metals, which predicts roughly equal annihilation contributions from cation and anion. We also present result obtained using Munich positron microprobe on laser damaged SiO2 samples.

NTIS
Positrons; Insulation; Positron Annihilation

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20030057137 Nebraska Univ., Omaha, NE, USA

Disaster Preparedness, Emergency Response, and Curriculum Development: A White Paper for the Tim Forte Collegiate Aviation Safety Symposium

Schaaf, Michaela M.; Bowen, Brent D.; Collegiate Aviation Research and Education Solutions to Critical Safety Issues; April 2002; 8 pp.; In English; See also 20030057134; Copyright; Avail: CASI; A02, Hardcopy

A new upper-level aviation course at the University of Nebraska at Omaha resulted from the application of research in the area of safety, disaster preparedness, and emergency response. The course, Airport Safety and Security, was conceived following the crash of TWA 800 and the subsequent White House Commission and the growing awareness of emergency planning and disaster response in aviation. The course was developed utilizing research into curriculum needs in this area, including discussions with industry and government experts. The results of this research revealed components for inclusion, such as airport and ramp safety, OSHA requirements, risk assessment and management, disaster preparedness, emergency response plans, coordination among authorities, crisis communication, and passenger rights. The research also revealed that the structure of such a course lends itself to a seminar format and required many areas of expertise. The result is a comprehensive curriculum design which provides a model for ready implementation in collegiate aviation education programs.

Author

Education; Emergencies; Disasters; Planning; Safety Management; Aircraft Safety

20030057158 General Accounting Office, Washington, DC

Military Readiness: New Reporting System Is Intended to Address Long-Standing Problems, but Better Planning Is Needed

Mar. 2003; 38 pp.; In English

Report No.(s): PB2003-103685; GAO-03-456; No Copyright; Avail: CASI; A03, Hardcopy

The Department of Defenses (DOD) readiness assessment system was designed to assess the ability of units and joint forces to fight and meet the demands of the national security strategy. In 1998, GAO concluded that the readiness reports provided to Congress were vague and ineffective as oversight tools. Since that time, Congress added reporting requirements to enhance its oversight of military readiness. Therefore, the Chairman asked GAO to examine (1) the progress DOD made in resolving issues raised in the 1998 GAO report on both the unit-level readiness reporting system and the lack of specificity in DODs Quarterly Readiness Reports to the Congress, (2) the extent to which DOD has complied with legislative reporting requirements enacted since 1997, and (3) DODs plans to improve readiness reporting. GAO made recommendations to improve readiness reporting and to develop an implementation plan to allow DOD and the Congress to gauge progress in developing DODs new readiness reporting system. DOD did not agree with our recommendations. After reviewing its comments, we modified one recommendation but retained the others as originally stated.

NTIS

Congressional Reports; Military Operations; Combat; Deployment

20030057193 National Inst. of Allergy and Infectious Diseases, Bethesda, MD, USA

NIAID Biodefense Research Agenda for CDC Category A Agents

Feb. 2002; 74 pp.; In English

Report No.(s): PB2003-104419; No Copyright; Avail: CASI; A04, Hardcopy

As concern grows about the use of biological agents in acts of terrorism or war, Federal health agencies are evaluating and accelerating measures to protect the public from the health consequences of such an attack. In 1996, when NIAID made public its Research Agenda for Emerging Diseases, intentional introduction of infectious agents was not discussed explicitly. However, recent events have reminded us that bioterrorism can be a major contributor in disease emergence. The Institute has developed a Strategic Plan for Biodefense Research at the National Institute of Allergy and Infectious Diseases (NIAID), which outlines plans for addressing research needs in the broad area of bioterrorism and emerging and reemerging infectious diseases. This Biodefense Research Agenda supplements the strategic plan and articulates the goals for research on anthrax, smallpox, plague, botulism, tularemia, and viral hemorrhagic fevers. The research agenda focuses on the need for basic research on the biology of the microbe, the host response, and basic and applied research aimed at the development of

diagnostics, therapeutics, and vaccines against these agents. In addition, the agenda addresses the research resources, facilities, and scientific manpower needed to conduct both basic and applied research on these agents.
NTIS
Allergic Diseases; Diagnosis; Manpower; Public Health; Research Facilities; Terrorism; Warfare

20030057258 Lawrence Livermore National Lab., Livermore, CA
Lawrence Livermore National Laboratory 1999 Engineering Annual Summary
2000; In English
Report No.(s): DE2003-791507; No Copyright; Avail: National Technical Information Service (NTIS)
Contents include the following: Message from the Associate Director; Profile of Engineering; Technical Accomplishments; Business Accomplishments; New Ventures: Technology Centers; Honors and Awards; Engineering Tomorrow: 2000 Priorities; and Appendixes: Demographics.
NTIS
Technological Forecasting; Demography; Industrial Management

20030057259 General Accounting Office, Washington, DC
Defense Space Activities: Organizational Changes Initiated, but Further Management Actions Needed
Apr. 2003; 44 pp.; In English
Report No.(s): PB2003-103747; GAO-03-379; No Copyright; Avail: CASI; A03, Hardcopy
In January 2001, the congressionally chartered Commission to Assess USA National Security Space Management and Organization-known as the Space Commission-reported that the Department of Defense (DOD) lacked the senior-level focus and accountability to provide guidance and oversight for national security space operations. Congress mandated that GAO provide an assessment of DOD's actions to implement the Space Commission's recommendations. Thus, GAO (1) updated its June 2002 assessment of DOD's actions to address the Space Commission's recommendations, (2) ascertained progress in addressing other long-term management concerns, and (3) assessed the extent to which DOD has developed a results-oriented management framework for space activities.
NTIS
Defense Program; Management Planning; Aerospace Industry; Organizations

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20030057132 Defence Science and Technology Organisation, Edinburgh, Australia
Evaluation of Methods for Rapidly Inserting Data into an Oracle Relational Database
Porter, Mark I.; Coat, Ian L.; April 2003; 29 pp.; In English
Report No.(s): DSTO-TN-0487; DODA-AR-012-722; Copyright; Avail: Other Sources
In the Intelligence, Surveillance and Reconnaissance Division (ISRD) there are numerous applications in which large volumes of data are collected and analysed. Often, relational databases are used to store such data, as they improve certain analytical tasks through querying. In the literature, there is ample documentation of methods by which queries on a database may be optimized. However, there is scant information on the optimal technique for the initial insertion of data at high speed. This paper addresses the problem by investigating numerous insertion methods and comparing their performance for a given data set. The work was carried out on standard PCs running a commercially available database product (Oracle) and using common languages (such as Java, C and PL/SQL), and therefore may be of interest to the wider DSTO community.
Author
Data Processing; Evaluation; Relational Data Bases

20030057217 Lawrence Livermore National Lab., Livermore, CA
BioZoom: Exploiting Source-Capability Information for Integrated Access to Multiple Bioinformatics Data Source
Liu, L.; Buttler, D.; Critchlow, T.; Han, W.; Paques, H.; Jan. 09, 2003; 16 pp.; In English
Report No.(s): DE2003-15002535; UCRL-JC-150297; No Copyright; Avail: Department of Energy Information Bridge
Modern Bioinformatics data sources are widely used by molecular biologists for homology searching and new drug

discovery. User-friendly and yet responsive access is one of the most desirable properties for integrated access to the rapidly growing, heterogeneous, and distributed collection of data sources. The increasing volume and diversity of digital information related to bioinformatics (such as genomes, protein sequences, protein structures, etc.) have led to a growing problem that conventional data management systems do not have, namely finding which information sources out of many candidate choices are the most relevant and most accessible to answer a given user query.
NTIS
Molecular Biology; Information Systems; Bioinstrumentation

20030057290 Lawrence Livermore National Lab., Livermore, CA
Efficient Video Similarity Measurement and Search
Cheung, S. C. S.; Dec. 19, 2002; In English
Report No.(s): DE2003-15002534; UCRL-LR-150280; No Copyright; Avail: National Technical Information Service (NTIS)
Duplication of multimedia content such as web video sequences has become a problem on the world wide web. This dissertation addresses this problem of redundancy. In it the author presents a system architecture and corresponding algorithms to efficiently measure, search, and organize similar video sequences found in any large database such as the web.
NTIS
Video Data; World Wide Web; Redundancy; Data Bases; Data Base Management Systems

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20030057120 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Abstracts for the 2002 Meeting of the AIAA Working Group on Dynamic Space Simulation
Simpson, Alda D., Technical Monitor; Worth, Daniel B.; [2002]; 1 pp.; In English; 2000 Meeting of the AIAA Working Group on Dynamic Space Simulation, 23-27 Sep. 2002, Toulouse, France; No Copyright; Avail: Other Sources; Abstract Only
Undersampling is sometimes used in order to save memory and reducing digitizing speed requirements for pyroshock data. Many interpolation techniques have been used to estimate the missing peaks due undersampling. The more exotic techniques may not work well when real data that contains noise is used as an input. Various peak interpolation techniques will be evaluated using noisy data in this presentation.
Author
Dynamic Control; Interpolation; Space Environment Simulation; Conferences

20030057122 Science Applications International Corp., San Diego, CA, USA
Advanced MHD Algorithm for Solar and Space Science: lst Year Semi Annual Progress Report
Schnack, Dalton D.; Lionello, Roberto; June 06, 2003; 11 pp.; In English
Contract(s)/Grant(s): NAS5-02085
Report No.(s): SAIC-03/8007:APPAT-316; Rept-01-0157-04-4478-100; No Copyright; Avail: CASI; A03, Hardcopy
We report progress for the development of MH4D for the first and second quarters of FY2004, December 29, 2002 - June 6, 2003. The present version of MH4D can now solve the full viscous and resistive MHD equations using either an explicit or a semi-implicit time advancement algorithm. In this report we describe progress in the following areas. During the two last quarters we have presented poster at the EGS-AGU-EUG Joint Assembly in Nice, France, April 6-11, 2003, and a poster at the 2003 International Sherwood Theory Conference in Corpus Christi, Texas, April 28-30 2003. In the area of code development, we have implemented the MHD equations and the semi-implicit algorithm. The new features have been tested.
Author
Algorithms; Aerospace Sciences; Mathematical Models; Solar Activity; Magnetohydrodynamic Waves

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20030056643 NASA Goddard Space Flight Center, Greenbelt, MD, USA
New Measurements of the Li, Be, and B Isotopes as a Test of Cosmic Ray Transport Models
deNolfo, Georgia A.; Yanasak, N. E.; Binns, W. R.; Cummings, A. C.; Davis, A. J.; George, J. S.; Hink, P. L.; Israel, M. H.; Leske, R. A.; Mewaldt, R. A., et al.; [2003]; 4 pp.; In English; 28th International Cosmic Ray Conference, 31 Jul. - 7 Aug. 2003, Tskuba, Japan; Copyright; Avail: CASI; A01, Hardcopy

Precise measurements of predominantly secondary cosmic-ray Li, Be, and B together with current well-measured production cross-sections for these isotopes help to improve our understanding of galactic cosmic ray propagation models. The Cosmic Ray Isotope Spectrometer (CRIS) on ACE has been measuring isotopic composition of cosmic rays since 1997 with high statistical precision. We present the isotopic abundances from CRIS and discuss these observations in the context of cosmic-ray transport models and previous cosmic-ray measurements.
Author
Lithium Isotopes; Cosmic Rays; Astronomical Models; Isotope Ratios; Radiation Counters; Beryllium Isotopes; Boron Isotopes; Energy Spectra

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20030055626 California Univ., Santa Cruz, CA, USA
Giant Molecular Cloud Structure and Evolution
Hollenbach, David, Technical Monitor; Bodenheimer, P. H.; [2003]; 7 pp.; In English
Contract(s)/Grant(s): NCC2-5418; No Copyright; Avail: CASI; A02, Hardcopy

Bodenheimer and Burkert extended earlier calculations of cloud core models to study collapse and fragmentation. The initial condition for an SPH collapse calculation is the density distribution of a Bonnor-Ebert sphere, with near balance between turbulent plus thermal energy and gravitational energy. The main parameter is the turbulent Mach number. For each Mach number several runs are made, each with a different random realization of the initial turbulent velocity field. The turbulence decays on a dynamical time scale, leading the cloud into collapse. The collapse proceeds isothermally until the density has increased to about 10(exp 13) g cm(exp -3). Then heating is included in the dense regions. The nature of the fragmentation is investigated. About 15 different runs have been performed with Mach numbers ranging from 0.3 to 3.5 (the typical value observed in molecular cloud cores is 0.7). The results show a definite trend of increasing multiplicity with increasing Mach number (M), with the number of fragments approximately proportional to (1 + M). In general, this result agrees with that of Fisher, Klein, and McKee who published three cases with an AMR grid code. However our results show that there is a large spread about this curve. For example, for M=0.3 one case resulted in no fragmentation while a second produced three fragments. Thus it is not only the value of M but also the details of the superposition of the various velocity modes that play a critical role in the formation of binaries. Also, the simulations produce a wide range of separations (10-1000 AU) for the multiple systems, in rough agreement with observations. These results are discussed in two conference proceedings.
Author
Molecular Clouds; Astronomical Models; Interstellar Chemistry; Star Formation; Fragmentation; Cloud Physics; Computerized Simulation; Gravitational Collapse

20030055634 Pennsylvania State Univ., University Park, PA, USA
The X-ray Spectrum of the North Polar Spur
Willingale, Richard; Hands, A. D. P.; Warwick, R. S.; Snowden, S. L.; Burrows, David N.; [2003]; 8 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-10079; Copyright; Avail: CASI; A02, Hardcopy

An analysis is presented of the soft X-ray background spectrum measured by the EPIC MOS cameras on XMM-Newton in three observations targeted on the North Polar Spur (NPS). Three distinct Galactic plasma components are identified, a cool

Local Hot Bubble (LHB) component, T(sub lo) approx. 0.1 keV, a cool Galactic Halo component at a similar temperature and a hotter component, T(sub hi) approx. 0.26 keV, associated with the NPS itself. Using the new data in combination with the Rosat All-Sky Survey count rates measured in the 0.1-0.4 keV band, we estimate the emission measure of the LHB material to be 0.0040-0.0052 cm(exp -6) pc, which implies an electron density of 0.008-0.011 cm(exp -3) and pressure of approx. 22000 cm(exp -3) K. The halo and NPS components lie behind at least 50\% of the line-of-sight cold gas for which the total Galactic column density is in the range (2 - 8) x 10(exp 20) cm(exp -2). Modelling the X-ray emitting superbubble as a sphere at distance 210 pc, radius 140 pc and center l(sub II) = 352 deg, b(sub II) = 15 deg, the implied electron density in the NPS is approx. 0.03 cm(exp -3) with pressure approx. 150000 cm(exp -3) K. The observed spectral line complexes from OVII, OVIII, FeXVII, NeIX, NeX and MgXI provide constraints on the composition of the plasma. The hot component in the NPS is depleted in oxygen, neon and, to some extent, magnesium and iron. Assuming the effective line of sight across the halo emission is 1 kpc, the electron density in the halo is 0.007-0.011 cm(exp -3) and the pressure is approx. 16500 cm(exp -3) K, conditions very similar to those in the LHB.
Author
X Ray Astronomy; X Ray Spectra; Space Plasmas; Galactic Structure; Line Spectra; Electron Density (Concentration); Cold Gas; Halos; Background Radiation

20030055668 NASA Marshall Space Flight Center, Huntsville, AL, USA
IMAGE-EUV Observation of Large Scale Standing Wave Pattern in the Nightside Plasmasphere
Six, N. Frank, Technical Monitor; Gallagher, D. L.; Adrian, M. L.; Sandel, B. R.; [2002]; 1 pp.; In English; AGU Fall Meeting, 5-11 Dec. 2002, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

We present analyses of a nightside plasmaspheric pattern of bifurcated, filamentary He(+) 30.4-nm emission enhancements observed by IMAGE EUV between approximately 19:40-22:13 UT on 28 June 2000 that indicate the presence of a large-scale, global ULF standing wave pattern. Analysis of coincident IMAGE magnetometer chain data reveals that these ULF waves extend across the magnetic latitude-longitude range of the chain and possess multiple spectral features between 0.6-5-mHz (3-30 minute period). Additionally, analysis of ACE SWE data reveals similarly structured spectral components in the solar wind. Collectively, these analyses lead to the conclusion that the observed large-scale ULF wave pattern is the result of solar wind pressure pulses 'ringing' the inner-magnetosphere.
Author
Plasmasphere; Solar Wind; Radiation Spectra; Plasmas (Physics); Standing Waves

20030056606 Hawaii Univ., Honolulu, HI, USA
CIZA: The First Systematic X-Ray Search for Clusters of Galaxies Behind the Milky Way
Ebeling, Harald; [2003]; 5 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-10773; No Copyright; Avail: CASI; A01, Hardcopy

The aim of the CIZA project (Clusters In the Zone of Avoidance) was to take the first step toward a complete X-ray census of clusters of galaxies behind the plane of the Galaxy (the absolute value of b less than or equal to 20 degrees), the historical Zone of Avoidance of optical extragalactic surveys. Finding these heavily obscured clusters in ROSAT All-Sky Survey data would allow us to: 1. Construct the first truly all-sky, statistically complete, X-ray flux limited sample of galaxy clusters; 2. Use this sample to obtain an improved measurement of the cluster dipole (both amplitude and direction); 3. Chart large-scale structure across the plane of the Milky Way as traced by galaxy clusters; 4. Identify potential massive galaxy clusters contributing to the observed large-scale flow pattern in the local universe, specifically in the region around the Great Attractor; and 5. Use least-action modelling to deduce the gravitational fields created by galaxy clusters and compare this reconstruction with the one obtained from local galaxy surveys. Our project was highly successful in demonstrating the feasibility of this undertaking and allowed substantial progress toward achieving the stated science goals.
Derived from text
Galactic Clusters; Milky Way Galaxy; X Ray Astronomy; Sky Surveys (Astronomy)

20030056641 Iowa Univ., Iowa City, IA, USA
Generation and Scattering of Radiation Observed by Voyager in the Outer Heliosphere
Spangler, Steven R.; Cairns, Iver H.; [2003]; 7 pp.; In English
Contract(s)/Grant(s): NAG5-7390; No Copyright; Avail: CASI; A02, Hardcopy

Excellent progress was made under this grant on the generation and scattering of the 2-3 kHz radio emissions observed by the Voyager spacecraft in the outer heliosphere. These are the most powerful radio emissions produced in our solar system,

surpassing even those of Jupiter and the Sun. The widely-held hypothesis pursued is that the radiation is generated near the electron plasma frequency f(sub p) or near 2f(sub p) as a shock wave traverses the heliosheath regions and/or heliopause predicted in the interaction region between the solar wind and the local interstellar medium. (Note that f (sup 2) (sub p) is proportional to the plasma density.) The traveling shock wave is plausibly associated with a global merged interaction region (GMIR). Accordingly, this so-called GMIR model is strongly analogous to the common interpretation of type II solar radio bursts and to radio emissions associated with Earth's bow shock, with coronal mass ejections (CMEs) and Earth's magnetosphere playing the role of a GMIR, respectively. Accordingly, Dr Cairns work on type II bursts, Earth's foreshock, and stochastic growth theory (not described in detail) strongly aided and complemented the research progress on the 2-3 kHz emissions described.
Derived from text
Heliosphere; Voyager 1 Spacecraft; Solar Radio Bursts; Solar System; Shock Waves; Radiation Distribution

20030056707 Hawaii Univ., Honolulu, HI, USA
High Temperatures and Disks Around PMS Stars: FUSE Spectra of Three Herbig Ae/Be Stars
Simon, Theodore; [2003]; 16 pp.; In English
Contract(s)/Grant(s): NAG5-10646; Copyright; Avail: Other Sources

The primary goals of the work performed under this grant were to search for: (1) spectroscopic evidence of high temperature plasma due to winds or chromospheres associated with a small sample of intermediate mass pre-main sequence stars, and (2) far ultraviolet absorption bands of molecular hydrogen (the Werner and Lyman bands) which could be used to probe the structure of the primordial circumstellar disks surrounding these stars.
Author
A Stars; High Temperature Plasmas; Ultraviolet Absorption; Molecular Gases; Hydrogen; Far Ultraviolet Radiation

20030057145 NASA Goddard Space Flight Center, Greenbelt, MD, USA
What is your Cosmic Connection to the Elements?
White, Nicholas E., Technical Monitor; Lochner, James; Rohrbach, Gail; Cochrane, Kim; [2003]; 29 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

This information and activity booklet describes the roles of the Big Bang, types of stars, supernovae, cosmic ray interactions, and radioactive decay in the formation of the elements. The booklet includes instructions for the following classroom activities, intended for students in Grades 9-12: Grandma's Apple Pie; Cosmic Shuffle; Nickel-odeon; Kinesthetic Big Bang; Elemental Haiku; Cosmic Ray Collisions; Cosmic Abundances; and What's Out There.
CASI
Students; Education; Chemical Elements; Universe; Big Bang Cosmology; Cosmic Rays; Radioactive Decay; Stars; Supernovae

20030057151 California Univ., Los Angeles, CA, USA
'Complexity' and Anomalous Transport in Space Plasmas
Wu, Cheng-Chin; Chang, Tom; Physics of Plasmas; [2002]; ISSN 1070-664X; Volume 9, No. 9, pp. 3679-3684; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-9111; Copyright; Avail: Other Sources

'Complexity' has become a hot topic in nearly every field of modern physics. Space plasma is of no exception. In this paper, it is demonstrated that the sporadic and localized interactions of magnetic coherent structures are the origin of complexity in space plasmas. The intermittent localized interactions, which generate the anomalous diffusion, transport, and evolution of the macroscopic state variables of the overall dynamical system, may be modeled by a triggered (fast) localized chaotic growth equation of a set of relevant order parameters. Such processes would generally pave the way for the global system to evolve into a complex state of long-ranged interactions of fluctuations. displaying the phenomenon of forced and/or self-organized criticality. An example of such type of anomalous transport and evolution in a sheared magnetic field is provided via two-dimensional magnetohydrodynamic simulations. The coarse-grained dissipation due to the intermittent triggered interactions among the magnetic coherent structures induces a 'fluctuation-induced nonlinear instability' that reconfigures the sheared magnetic field into an x-point magnetic geometry (in the mean field sense), leading to the anomalous acceleration of the magnetic coherent structures. A phenomenon akin to such type of anomalous transport and acceleration.

The so-called bursty bulk flows, has been commonly observed in the plasma sheet of the Earth's magnetotail.
Author
Space Plasmas; Topology; Complexity; Magnetic Anomalies; Mathematical Models; Magnetohydrodynamic Stability

20030057291 Lawrence Livermore National Lab., Livermore, CA
Recent Advances in the Collapse and Fragmentation of Turbulent Molecular Cloud Cores
Klein, R. I.; Fisher, R.; Krumholz, M.; McKee, C. F.; Dec. 16, 2002; 14 pp.; In English
Report No.(s): DE2003-15002743; UCRL-JC-150165; No Copyright; Avail: Department of Energy Information Bridge

One of the major goals of this research is to understand the nature of the formation of binary and multiple stellar systems with typical low mass stars 0. 2 to 3 Ma and the physical properties of these systems. Basic questions concerning this process remain unanswered. What determines the fraction of an unstable cloud that will fragment into protostellar objects. What determines the pattern of stellar clustering into binaries and multiple systems. Even after fragmentation occurs, we have little understanding of the subsequent collapse. Consequently, it is unclear how the mass distribution of fragments maps onto eventual stellar masses, something we must understand to explain the stellar initial mass function (IMF). We will first discuss the development of the numerical methodology that will contribute to answering these questions. This technology consists of a 3D parallel, adaptive mesh refinement (AMR) self-gravitational, radiation-hydrodynamics code that we have developed. We will present new results for the gravitational collapse and fragmentation of marginally stable turbulent molecular cloud cores &d follow the collapse of high mass fragments as they interact with the radiation of the protostars forming at their centers. We will discuss the theoretical difficulties in forming binary stars and the role of turbulence in their formation.
NTIS
Hydrodynamics; Molecular Clouds

91
LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20030056594 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Minerologic and Petrologic Studies of Meteorites
Boyce, J., Technical Monitor; Wood, John A.; Petaev, M. I.; May 2003; 3 pp.; In English
Contract(s)/Grant(s): NAG5-9365; No Copyright; Avail: CASI; A01, Hardcopy

This report provides a listing of the publications published by the Principal Investigator, J.A. Wood and co-worker M.I. Petaev during the reporting period
CASI
Meteorites; Meteoritic Composition; Cosmochemistry; Petrology

20030057206 Lawrence Livermore National Lab., Livermore, CA
Submillimeter Spectra of Low Temperature Gases and Mixtures
Wishnow, E. H.; Gush, H. P.; Halpern, M.; Ozier, I.; Sep. 19, 2002; 10 pp.; In English
Report No.(s): DE2003-15002530; UCRL-ID-150959; No Copyright; Avail: Department of Energy Information Bridge

Submillimeter absorption spectra of nitrogen, nitrogen-argon mixtures, and methane have been measured using temperatures and pressures near to those found in the atmospheres of Titan and Saturn. The experiments show the spectral signature of dimers which will likely appear in far-infrared spectra of Titan that will be obtained by the Composite Infrared Spectrometer (CIRS) onboard the Cassini spacecraft. The recent CIRS spectrum of Jupiter shows far-infrared spectral lines of methane and the corresponding lines are observed in the laboratory.
NTIS
Atmospheric Composition; Gases; Planetary Atmospheres

20030057241 Lawrence Livermore National Lab., Livermore, CA
Recent Science and Engineering Results with the Laser Guidestar Adaptive Optics System at Lick Observatory
Gavel, D.; Gates, E.; Max, C.; Oliver, S.; Bauman, B.; Oct. 17, 2002; 12 pp.; In English
Report No.(s): DE2003-15002513; No Copyright; Avail: Department of Energy Information Bridge

The Lick Observatory laser guide star adaptive optics system has undergone continual improvement and testing as it is

being integrated as a facility science instrument on the Shane 3 meter telescope. Both Natural Guide Star (NGS) and Laser Guide Star (LGS) modes are now used in science observing programs. We report on system performance results as derived from data taken on both science and engineering nights and also describe the newly developed on-line techniques for seeing and system performance characterization. We also describe the future enhancements to the Lick system that will enable additional science goals such as long-exposure spectroscopy.
NTIS
Laser Guide Stars; Adaptive Optics; Telescopes; Spectroscopy

20030057276 Lawrence Livermore National Lab., Livermore, CA
Gallery of Datacubes Obtained with the Livermore Imaging Fourier Transform Spectrometer
Wurtz, R.; Wishnow, E. H.; Blasi-Outellette, S.; Cook, K. H.; Holden, B. P.; Sep. 12, 2002; 10 pp.; In English
Report No.(s): DE2003-15002531; UCRL-JC-150958; No Copyright; Avail: Department of Energy Information Bridge

We have acquired spatial-spectral datacubes of astronomical objects using the Livermore visible-band imaging Fourier transform spectrometer at Apache Point Observatory. Each raw datacube contains hundreds of thousands of spectral interferograms. We present in-progress demonstrations of these observations.
NTIS
Image Processing; Infrared Spectroscopy; Astronomical Spectroscopy

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20030055661 Hawaii Univ., Honolulu, HI, USA
Observational Investigation of Solar Interior and Atmosphere
Kuhn, Jeffrey R.; June 05, 2003; 3 pp.; In English
Contract(s)/Grant(s): NAG5-4941; No Copyright; Avail: CASI; A01, Hardcopy

The Imaging Vector Magnetograph (IVM) has been modified to make it easier to observe at more than one spectral line. The cell holding the blocking filter has been replaced by a four-position filter wheel, so that changing to a different line is a matter of a few minutes rather than the several hours it used to take to disassemble the cell and install a new filter. Three new filters have been obtained, for Na 1589.6 nm, Fe 1630.25 nm, and H 1656.3 nm. The new filters have better bandpass profiles than the ones they replaced: somewhat wider, with flatter tops and steeper wings. This results in a reduction of parasitic light coming from adjacent Fabry-Perot orders, from seven percent to about two percent, and flattens the apparent continuum. The Mees CCD Imaging Spectrograph (MCCD) was upgraded under this grant, with a new control computer and data system. The camera was replaced with a faster, larger-format frame-transfer camera. Final integration of the upgrades is not yet complete, but tests indicate that the system cadence will be improved by a factor of five to ten, while increasing the spatial coverage by a factor of two (depending on observation options). Synoptic observations with the IVM and MCCD continue to be conducted daily, to the extent permitted by the fact that we have a single observer responsible for the observations. The older Haleakala Stokes Polarimeter is also used to make a daily vector magnetogram, normally of the region selected by the Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) duty scientists. This instrument, however, is showing its age to the extent that its maintenance is becoming something of a challenge. We also run a white light full-disk imager and a video H alpha prominence camera, continuously during times of observations. Of particular interest, we obtained rapid-cadence observations of the 2003 July 15 white light flare with both the IVM and MCCD. The vector magnetograms show no obvious difference between the preflare and postflare configurations. The photospheric magnetogram sequence and H alpha spectra we obtained can be combined with spacecraft observations to construct a rather detailed picture of the events of this flare. Several papers are in preparation.
Author
Solar Interior; Solar Atmosphere; Spectrographs; Charge Coupled Devices; Prominences; Bandpass Filters; Cameras; Polarimeters

20030056680 California Univ., Los Angeles, CA, USA
The Interplanetary Magnetic Field and Magnetospheric Current Systems
El-Alaoui, Mostafa; [2003]; 5 pp.; In English
Contract(s)/Grant(s): NAG5-9255; No Copyright; Avail: CASI; A01, Hardcopy

We have performed systematic global magnetohydrodynamic (MHD) simulation studies driven by an idealized time series of solar wind parameters to establish basic cause and effect relationships between the solar wind variations and the ionosphere parameters. We studied six cases in which the interplanetary magnetic field (IMF) rotated from southward to northward in one minute. In three cases (cases A, B, and C) we ran five hours of southward IMF with Beta(sub Zeta) = 5 nT, followed by five hours of northward IMF with Beta(sub Zeta) = 5 nT. In the other three cases (cases D, E, and F) the magnetic field magnitude was increased to 10 nT. The solar wind parameters were: For cases A and D a density of 5 cm(exp -3), a thermal pressure of 3.3 nPa, and a solar wind speed 375 km/s, for cases B and E a density of 10 cm(exp -3), a thermal pressure of 9.9 nPa, and a solar wind speed 420 km/s, while for cases C and F a density of 15 cm(exp -3), a thermal pressure of 14.9 nPa, and a solar wind speed of 600 km/s.
Author
Interplanetary Magnetic Fields; Magnetohydrodynamics; Applications Programs (Computers); Time Series Analysis; Solar Wind; Computerized Simulation

20030056681 California Univ., Los Angeles, CA, USA
Distinct Magnetospheric Responses to Southward IMF in Two Substorms
El-Alaoui, Mostafa; Ashour-Abdalla, M.; Richard, R. L.; Frank, L. A.; Paterson, W. R.; Sigwarth, J. B.; [2003]; 6 pp.; In English
Contract(s)/Grant(s): NAG5-9255; NAG5-11704; Copyright; Avail: CASI; A02, Hardcopy

Solar wind plasma parameters and the Interplanetary Magnetic Field (IMF) observed by the WIND spacecraft upstream of the bow shock were used as input to magnetohydrodynamic (MHD) simulations of two substorm events. The power deposited into the ionosphere due to electron precipitation was calculated both from VIS observations and from the simulations.
Author
Magnetohydrodynamics; Plasmas (Physics); Computerized Simulation; Astronomical Models; Mathematical Models; Electron Precipitation; Solar Planetary Interactions

99
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20030056632 Alabama Univ., Huntsville, AL, USA
Alabama NASA EPSCoR Preparation Grant Program: Grant No. NCC5-391
Gregory, John C.; May 2003; 16 pp.; In English
Contract(s)/Grant(s): NCC5-391; No Copyright; Avail: CASI; A03, Hardcopy

The funded research projects under the Experimental Program to Stimulate Cooperative Research (EPSCoR) grant program and the student fellowship awards are summarized in this report. The projects include: 1) Crystallization of Dehydratase/DcoH: A Target in Lung Disease; 2) Measuring Velocity Profiles in Liquid Metals using an Ultrasonic Doppler Velocimeter; 3) Synthesis, Structure, and Properties of New Thermoelectric Materials; 4) Computational Determination of Structures and Reactivity of Phenol-Formaldehyde Resins; 5) Synthesis of Microbial Polyesters in the NASA Bioreactor; 6) Visualization of Flow-Fields in Magnetocombustion; 7) Synthesis of Fluorescent Saccharide Derivatives. The student fellowship awards include: 1) Distributed Fusion of Satellite Images; 2) Study of the Relationship between Urban Development, Local Climate, and Water Quality for the Atlanta, Georgia Metrop; 3) Computer Simulation of the Effectiveness of a Spring-Loaded Exercise Device.
CASI
Diseases; Velocity Distribution; Liquid Metals; Phenol Formaldehyde; Flow Visualization; Satellite Imagery; Urban Development; Computerized Simulation

Subject Term Index

Personal Author Index